

NATURE MAGAZINE



March, 1948

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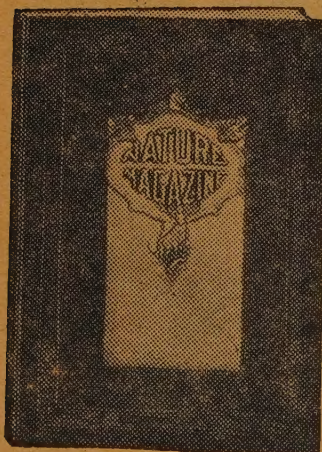
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Nature in Print

By HOWARD ZAHNISER

It is pleasant and refreshing to note, occasionally, some of the more intimate volumes, mostly verse, that find their way to a reviewer's desk and often are crowded out of attention in writing by the more imposing, the more apparently "significant," volumes of the times. Here, for example, are seven volumes that have found their way to this reviewer during the past year and yet have been unnoticed, although it has been immediately good to read them. It is a pleasure to call attention to them now, and to congratulate their authors.

There are many who will appreciate the Rev. Dr. Joseph James Murray's collection of essays entitled *Wild Wings*. Dr. Murray is pastor of the Lexington (Va.) Presbyterian Church. He also is editor of *The Raven*, the journal of the Virginia Society of Ornithology, and an earnest Nature student. For some time he has been contributing Nature sketches to the young people's paper of his denomination, and with one exception the essays in *Wild Wings* are revisions of these sketches. They are, however, by no means juvenile, or even pastoral. Rather they are simply delightful and informative descriptions and reflections of bird watching near home and of experiences farther afield—in the Dismal Swamp and the Smokies, for example, and in foreign countries. Two of the most interesting essays in the volume, in a closing section called "Long Ago," deal with "Jesus and Nature" and with biblical quotations on Nature. It has been a profitable pleasure to read *Wild Wings*, and the book has proved to be a good source for family readings. One can recommend it heartily, and take special delight in suggesting that any reader of this page might well present his own pastor with a copy.

Come Climb My Hill is likewise a volume that will be welcome to many readers. Winston O. Abbott says that in it he has only one purpose—"to share with you the beauty that I have found upon my hill, for I have slowly learned that beauty has a mood for every need." Certainly, however, Mr. Abbott has shared with many of us a delight also in the beauty of a well-made book. His own writings are simply eloquent in their expressions of his reflections on rain, snow, mountains, and other aspects of Nature, and joys and sorrow, as ministered to and interpreted by Nature, and they are distilled into the briefest of essays, seventeen of them, each on a "mood of Nature." His illustrator, his typographer, and his bookmaker have joined with him to present these writings in an exquisite small volume—a much-and-rich-in-little book that is as satisfying to hold as to read.

The rest of these volumes are verse, although one of them—*We Harness a River*—includes also within its covers a story in prose and a lengthy autobiographical and reminiscent sketch, a work that stands alone, unclassified. Its verse celebrates the outdoors of the West, particularly of the desert, and its enthusiasm is greatest in exultation over the prospects of irrigation. Its prose story has also an irrigation setting, although its most sig-

nificant comment is in the statement: "When I see the Teton Peaks reachin' up to touch the sky, and breathe the clear mountain air, I'll come back to reality and be glad I'm still alive." The volume must indeed be a welcome one to the many friends of Irene Welch Grissom, who is poet laureate of Idaho, and it is a pleasure to have shared their satisfactions.

E. S. Hole's *Sanity Rare: An Essay in Verse* was at once interesting reading but not a conventional choice for "Nature in Print." Apparently it is a long-time result of its author's avocational interests, and much both of wisdom and of acquaintance with poets has found its way into this collection of quatrain-paragraphs.

"They err who think that culture they express
By luxury combined with idleness!
He is not cultured who has lily hands—
But he who has a mind which understands."

Elizabeth Sim Roberts' *Harvest of the Greenwood* is a good harvest, both of verse and of experiences with Nature. "Beauty is Everywhere," says the poet in one of her titles, and the poem that follows well represents her writing and her sensitiveness:

"I have seen beauty in so many things;
In primrose-bordered lanes of other springs,
In blue-belled hyacinths upon a forest floor,
In heather, and the way a skylark soars.

"I have found beauty in tall peaks that guard,
Like sentinels, a valley's clovered sward,
Through which a river flowing endlessly,
Carved out its silver pathway to the sea.

"From castled hill and stately monument,
From misty mornings sweet with hawthorn scent,

I gathered beauty . . . and, through sunsweet days,
Heard wildrose blossoms sing their Maker's praise."

There are poems in this volume on the pileated woodpecker, on the white-crowned sparrow, on a bird refuge, on Mount Saint Helens, and on other specific aspects of Nature, and the concluding section of the book is a nostalgic group of poems inspired by recollections of the Esk Valley in Cumberland, England. Those especially who have enjoyed Mrs. Roberts' verses as published in magazines will appreciate this volume, her first book of poems, and still others have now an opportunity to make her acquaintance.

The Wilding Heart, by Margaret Swift Hosmer, includes poems that already have appeared in *Nature Magazine*, and, indeed, the book itself was earlier reviewed with commendation in this magazine. The present volume is, in fact, a new issuance—a second edition—of these poems, and one can thus the more congratulate the poet whose writings are continuing to meet an enlarging audience. The volume is unusually rewarding in a cover-to-cover reading because of the variety of the poet's interests and her facility with various verse forms. Here is a long poem telling the tale of Persephone. Here are poems about books and the heroes and heroines of literature. Here are ballade and simple narrative. Here are many sonnets—and also such a poem as "Sea Fog in the Mountains":

"I saw the fog come up in the lanes of the mountains.

In the narrow valleys I met with the
surging mist

—Soft as the wing of dove—

Come up from the sea I love

That the wings of wind have kissed.

"I knew that the fog was enwrapping fall-
ing fountains

Whose music was lost amid broken
walls of rock.

Fair were the ways of the fog in the van-
ishing mountains,

Lost where the cloud-drifts flock.

"Drench me and drown me, rain, in these
steep stone mountains!

Here in this limbo fog I shall linger
alone,

Where the mist from the sea

Is enfolding me—

Loving only the fog and the wind and
the stone."

Edwin O. Grover's *Nature Lover's Knapsack* is also a new edition—a new and enlarged edition of a work that has already established itself. No one interested in the outdoors and in the poets' expressions of this interest requires anything more from a reviewer of this work than the simple statement that here are more than three hundred lyrics by more than two hundred of the "best" poets, selected and arranged by a veteran Nature lover and anthologist. This reviewer, having already read the earlier edition, has read this new volume through with pleasure from cover to cover, with occasional bursts into reading aloud—and with the incidental result of noting that Robert Browning's eloquent salute to the sunrise has found its way into the volume twice, and welcome it was the second time, too.

"Next to the recollection of beauties we have seen with our own eyes," says Dr. Grover in his introduction, "there is no joy greater than walking afield with the poets." And it is perhaps a supreme tribute to his own anthology to say that *The Nature Lover's Knapsack* well demonstrates this statement.

Wild Wings. By Joseph James Murray. Richmond, Va.: John Knox Press. 1947. 123 pp., with 15 photographs. \$2.50.

Come Climb My Hill. By Winston O. Abbott. Portland, Maine: Falmouth Publishing House. 1947. 78 pp. (all unnumbered), with 18 drawings by Leon Tebbets. \$2.

The Nature Lover's Knapsack: An Anthology for Lovers of the Open Road. New York: Edited by Edwin Osgood Grover. Thomas Y. Crowell Co. 1947. 294 pp., with introductory essay "On Knapsack Carrying," and indexes. \$3.

We Harness a River. By Irene Welch Grissom. Caldwell, Idaho: The Caxton Printers. 1946. 155 pp., with 17 photographs. \$3.

Sanity Rare: An Essay in Verse. By E. S. Hole. London: George Allen and Unwin Ltd. 1947. 101 pp. 5s.

The Wilding Heart. By Margaret Swift

Hosmer. Revised Edition. Hollywood, Calif.: Hollycrofters. 1947. 177 pp. \$2, from the author, 946 S. Burlington Ave., Los Angeles 6, Calif.

Harvest of the Greenwood. By Elizabeth Sim Roberts. Chicago: The Dierkes Press, 1947. 64 pp., with tipped-in photograph of "The Valley of the Esk." \$2.

Washington Birds

Field Guide to the Birds of King County, Washington. By Earl J. Larrison. Seattle, Washington. 1947. The Seattle Audubon Society. 66 pages. Illustrated by Elizabeth L. Curtis. 55 cents.

This is the first in The Trailside Series of occasional publications being brought out under the auspices of the live-wire Seattle Audubon Society, and under the editorship of H. W. Higman. This booklet is a revision and expansion of an earlier guide to the birds of the Seattle area by the same author. Some 266 birds are known to occur in King County, as residents or visitors, and are treated in the handy and practical little guide.

Weather Observation

Techniques of Observing the Weather. By Benarthur C. Haynes. New York. 1947. John Wiley and Sons. 272 pages. Illustrated. \$4.00.

Although they probably will not do away with the functions of the U. S. Weather Bureau, the library of books designed to make every man his own weather prognosticator is growing. This immediate volume is an excellent addition to that library, a useful and practical book for the amateur and semi-professional forecaster. It is also a textbook for use in high school and college courses in elementary meteorology.

Trees and Toadstools

Trees and Toadstools. By Dr. M. C. Rayner. Emaus, Pa. 1947. The Rodale Press. 91 pages. Illustrated. \$2.50.

In his preface the author says that "this book was planned with two ends in view. One, to draw attention to a regularly recurring phenomenon of our woods and pastures; the other, to reveal to the non-scientific reader something of the unseen forces at work." It treats with the association between the toadstool-producing fungi of woodlands and our common trees.

Dr. Oberholser Retires

In order to devote his entire time to finishing his work on the birds of Texas, Dr. Harry C. Oberholser has retired from his post as Curator of Ornithology at the Cleveland Museum of Natural History, a post he has held since his retirement from the U. S. Biological Survey. During the past six years he has been building up the museum's bird collection and doing much editorial work on scientific publications. He will continue to live in Cleveland.

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Devoted to the Practical Conservation of the Great National Resources of America

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Apology to Mr. Guiterman

For the second time since we began publishing poetry in *Nature Magazine* our face is a rich, ruby red. Only twice have we fallen for a plagiarism, the second time by publishing the poem, "Maine Wood Magic", in our February, 1948, issue. This poem, almost verbatim, is the original work of the fine poet, the late Arthur Guiterman. It first appeared in F.P.A.'s "Conning Tower" in the *New York Herald-Tribune*, and later was included in Guiterman's collection, *Death and General Putnam*, published in 1935. These facts were called to our attention by another poet of substance, Paul H. Oehser, and, as we write this apology, he is undoubtedly the colonel of a regiment that will similarly advise us.

In justice to ourselves may we say that Mr. Harold M. Dudley, as we said in an editorial note accompanying the poem, called this to our attention. He first read it to us over the telephone, suggesting that it was too fine a poem to be lost in the relative obscurity of the book, *This New America*, of which he was co-author. We said it was, indeed, a fine poem and that we would like to see a copy. He sent it; we read it, and then telephoned him to say that we could not understand why a poet who could write such a splendid poem had not been heard from since. We also said that we were rather doubtful of the poem's authenticity. Mr. Dudley replied that he was sure the poem was original with Philip O'Donnell, and that, anyway, it had been published in the book, in circulation for ten years, without anyone questioning the poem. This seemed logical and lulled our suspicions.

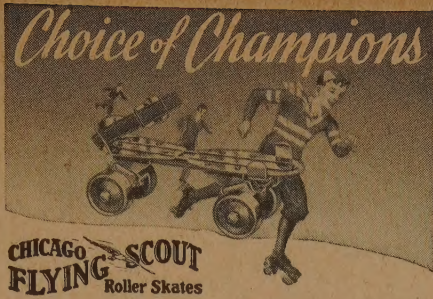
Having thus recited the case history of a plagiarism, we now bow in humble apology to, Arthur Guiterman's memory, and to E. P. Dutton, his publishers, an apology that Mr. Dudley echoes, and, we hope, Mr. O'Donnell, wherever he is.

Botanical Expedition

The Royal Botanical Expedition to New Spain. Translated and collated by Harold William Rickett. Waltham, Massachusetts. 1947. Chronica Botanica Co. New York. Stechert-Hafner, Inc. 86 pages. Illustrated. \$2.50.

In this publication Dr. Rickett, bibliographer of the New York Botanical Garden, has translated and arranged, from the documents in the archives of Mexico, the story of the expedition sent by Charles III in 1787 to survey the "natural productions" of his domain of New Spain and to establish there a botanical garden. The compiler has covered the period from the start of the expedition to 1820, thus providing a history of botany in Mexico for those thirty-three years.

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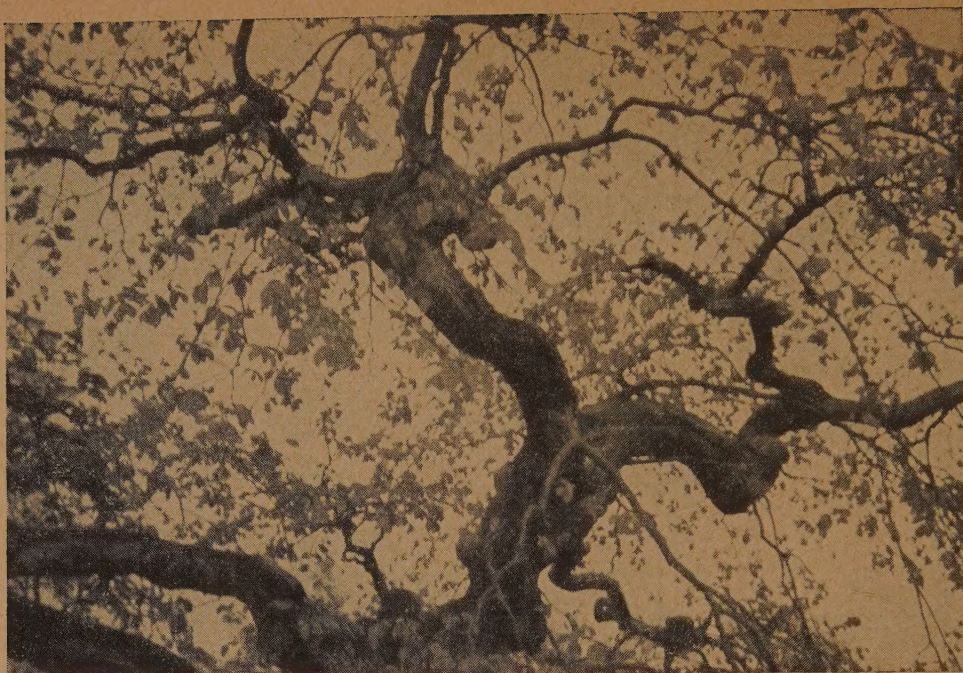
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Pattern of Life

By THOMAS E. HADLEY

WHEN Joyce Kilmer wrote: "Only God can make a Tree" he voiced the inborn faith of human beings in the universe; the evolutionary pattern of life; all growing things. It is refreshing to know that, in spite of economic booms and depressions and the rigors of war, Nature carries on in orderly, uninterrupted fashion. Flowers bloom, birds sing, fruit ripens, rain falls, rivers continue to flow onward to sea, each reacting to natural laws, pushing out into the world of reality and solving its own particular problem.

A tree such as the Camperdown Elm above is so expressive of life. It has a homely beauty such as characterized Lincoln's face; a gentle, rugged strength born of patience. It has found life hard and uncompromising. It has had to fight every inch of the way. It was born of a seed without choice of environment except as the wind blew and the soil upon which it fell proved fruitful. Under irresistible urge it reached toward the sun and dug its roots into the soil. It sent its tiny tendrils deeper, deeper into the ground in search of food and minerals and necessities of life. And under a cosmic pattern it organized these materials into shape and form of root, into trunk and branch and leaf. Through the course of seasons it bloomed and set about in earnest to reproduce its own seed and perpetuate the species.

Winters came and checked its growth; drove its sap underground into hibernation, close to the breast of Mother Earth. Winds came, and howling blizzards tried it sorely, pruning its weaker branches, stripping it of its leaves and mantle, leaving it bare and for-

lorn. At times it seemed that it could not survive, that the rigors of sun and storm, cold and wind would rob it of its very life. But it grew on, twisted and gnarled and wrinkled, to a ripe old age, each year passing through the cycles of the seasons. It was vibrant and cheerful in the springtime, happy in the summer, fruitful in the fall, and worn and weather-beaten in the winter. Each year it struggled desperately to survive, and each year, at springtime, awakened to the song and cheery companionship of the birds as they built their homes and reared their young in its leafy head, and the bees as they droned through the love-making pollen season.

Springtime's splendor, child of chance,
Summer's son of circumstance,
Autumn's ageing man mature,
Winter's worldly seeds secure.

How much like our own pattern of life. The birth without choice, the struggle to survive, the spring and summer, fall and winter; youth and manhood, maturity and old age; the seed we leave, not of its own choice but of ours, which proves the undying destiny of love and life. Like the tree we have no choice of birth, but, unlike the tree, we have advanced along the evolutionary "Pattern of Life" to a choice of habitation and environment. And we in America would choose no other.

Born without choice,
But the choice is our own,
To pass on the Seed,
When the Life becomes known!

Contents Noted

THERE is, to us, a special significance in the first Inter-American Conference on the Conservation of Renewable Natural Resources, which will be held in Denver, Colorado, from September 7 to 20 of this year. Barely into its first long trousers in the United States, conservation is still pretty much in the diaper and rubber pants stage in Central and South America. North America has learned many of the lessons of conservation in hard and expensive ways, and, in many cases, still has to put the fruits of some of these lessons into practice. Nevertheless, we have made progress that can be helpful to our sister nations to the south. They can, if they will, benefit by our mistakes, and this forthcoming conference provides an opportunity for all the countries of the Western Hemisphere to consider conservation problems together. The two-week session in Denver will not be merely a long series of papers, but will consist of meetings interspersed with field trips that will cover actual programs of soil conservation, land management, forest administration, park philosophy, and other going concerns in the conservation structure. An imposing and searching agenda has been prepared for the conference, a program that goes thoroughly into the dynamic relationships that exist between populations and their renewable natural resources. The future of this hemisphere, and, indeed, the world, depends heavily upon the success with which Americans—North and South—recognize and understand the vital necessities of hemispheric conservation.

STARTING the second decade of such observance, National Wildlife Week begins this year on the first day of spring, March 21. Sponsor of this Week is the National Wildlife Federation, which, each year, issues a lovely sheet of Nature stamps as a part of the observance. Actually the emphasis urged for Wildlife Week is fully as much on conservation of soil, waters and forests as it is upon wildlife, since these are all components of the closely spun biological web. Details and materials in connection with Wildlife Week may be obtained from David A. Aylward, president of the Federation, 20 Spruce Street, Boston 8, Massachusetts.

“JUST what kind of barbarians do they have in Arkansas that 6000 of them could watch such a spectacle of brutality with ‘great delight’?” asks a reader, commenting on *Life’s* recent feature “Coon on a Log”. In printing this *Life* wondered, too, and did a service by calling to general attention this barbarism. The feature, if you missed it, showed a “sport” involving a raccoon chained to a log in water a few yards from shore. To the log swims a ‘coon dog, and the contest is to see how successfully and

how soon the dog can capture the raccoon and carry it to the end of its chain. Bloody events ensue. According to the *Life* story a humane society representative did not object to the proceedings. We would be inclined to ask, with our correspondent, “What kind of humane societies do they have in Arkansas?”

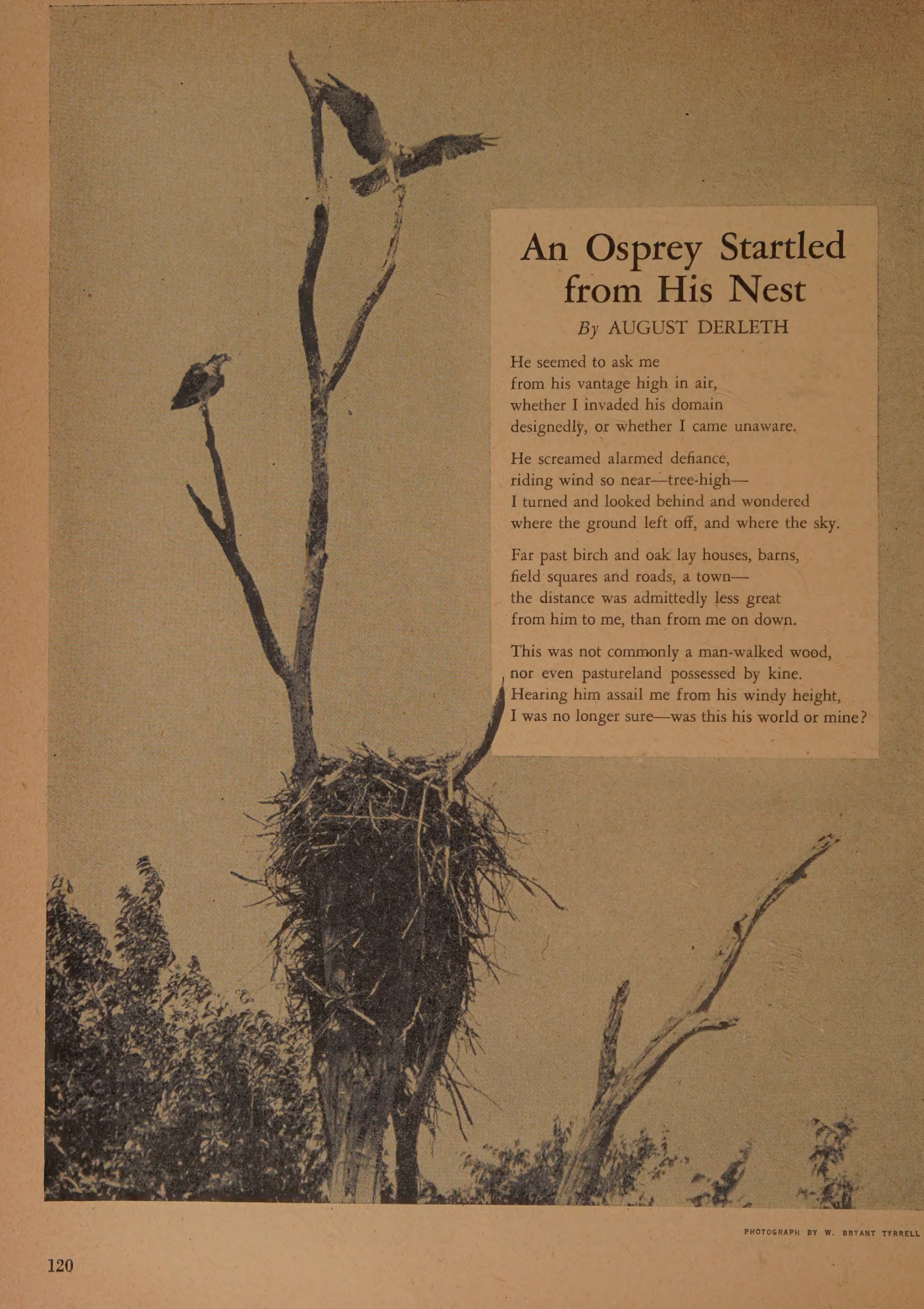
“THIS month we are going to move into an empty dwelling, so we will be sleeping on loose straw, for we have no blankets, bedding, or straw sacks.” “. . . our clothing has not been replaced for eight years and our food has not been sufficient for over ten years.” “I had the largest private collection of European mammals in Germany. But now is all destroyed, my great library, too.”

These are a few excerpts from letters written by European mammalogists whose lives, families and work have been shattered by the juggernaut of war. It is to aid these scientists that the Emergency Committee for Relief of European Mammalogists of the American Society of Mammalogists is now exerting every effort. Money, of course, is needed, and no contribution is too small. Ten dollars will send a C.A.R.E. package of food. Clothing is badly needed, although it must be sent by the individual donating it. Names of needy scientists can be supplied.

Chairman of the Committee is Mrs. D. R. Murdock, 1305 Lindbergh Avenue, Washington Court House, Ohio. Money may be sent to her.

MAYBE Clark Gable’s recent tangle with the law for having more than his limit of ducks in possession will enhance his “he-man” reputation in some quarters, but we are inclined to agree with Metro-Goldwyn-Mayer’s lawyer, who moaned that this little shooting spree had cost the studio a million dollars in bad publicity. Gable, along with other movie big-wigs, including Johnny Mack Brown, politely paid his two-hundred-dollar fine, but the memory lingers on. However, one hopeful by-product of the incident is to point a questioning finger at what members of swank duck clubs are getting away with. Few records are made at, or required of, these clubs. If a warden comes in to investigate and finds a number of ducks, all he can do is to count noses and if the noses divide into x, and show no surplus over the allowable two-day bag, the warden can do nothing, even though half of those present may have been spending their time playing chess or a hot game of bezique while their pals were out shooting for them. Some fine day movie studio publicity people will wake up to the fact that not only is it bad business for big-name properties to get thus tangled up with game law violation, but it is equally bad public relations to have these stars photographed with trophies of the chase festooned about them. The vast majority of movie-goers do not hunt and do not enthuse about killing exploits.

R. W. W.



An Osprey Startled from His Nest

By AUGUST DERLETH

He seemed to ask me
from his vantage high in air,
whether I invaded his domain
designedly, or whether I came unaware.

He screamed alarmed defiance,
riding wind so near—tree-high—
I turned and looked behind and wondered
where the ground left off, and where the sky.

Far past birch and oak lay houses, barns,
field squares and roads, a town—
the distance was admittedly less great
from him to me, than from me on down.

This was not commonly a man-walked wood,
nor even pastureland possessed by kine.
Hearing him assail me from his windy height,
I was no longer sure—was this his world or mine?

PHOTOGRAPH BY W. BRYANT TYRRELL



One World

By ALAN DEVOE



IT is frequently urged upon us nowadays that we adopt a concept that is most often described by the phrase "One World". The idea summed up in the convenient phrase One World is this: That all the peoples of this earth are in truth a unitary whole—the entity of the human race—and that for the solution of our difficulties we must abolish the false and arbitrary divisions within this whole and must act together with a sense of the reality of that common brotherhood, which does, in fact, contain and link us all. The idea of One World is a modern statement of a very old religious declaration: We are all members one of another.

The concept of One World is indeed vitally important for us to adopt and live by. No one can read the reports of the atomic scientists and doubt the need for an intensification of our sense of the general brotherhood of all mankind, if our species is not to be threatened by destruction. The idea of One World must be adopted, certainly. But I should like to plead for recognition of our membership in an even greater community. I should like to plead that the wholeness of our One World be seen as a still larger wholeness, a still more encompassing and unitary brotherhood, including not only the peoples and the nations, but including, too, our brotherly birds and brotherly beasts, our trees, soil, and sky.

All the created world, in all its parts and entirety, is a united whole. All creatures in it are in a common brotherhood. Everything, as the philosophers used to say, is interconnected with everything else. Not only is there a basic brotherhood between a man in England and a man in America, or a man in Antarctica and a man in Siberia, but also there is a bond between a man and a mouse, or a tree and a fox, or a frog and a raccoon. We are all participants together in the united entirety of the creation. We are all the creatures of the one parental and primary source of all begetting, whether we may like to call that source Nature, or may like to call it something pseudo-scientific like the Life-Force, or whether we may like to employ the traditional language of religious utterance and use the name of Almighty God.

The sense of brotherhood with all our fellow-ingredients in the created world is a very old thing, a

primitive awareness, a kind of spontaneous poetry going back to our very earliest dawn-days. The aboriginal Indian thought of the bear as his brother. He felt his relationship, and thus a kind of family obligation, even to the herbs he gathered and the trees he felled. But the sense of brotherhood, thus felt, is not a merely primitive thing. It has been felt by religious men and sensitively aware men in all times. There comes to mind St. Francis of Assisi, looking out upon a universe of what he understood to be his fellow creatures, and thus saluting with brotherly affection his "sister the moon", and his "brother ox", and his brothers the wolf and the stag and the heron and the rabbit.

What primitive men and contemplative men have always felt—this brotherhood of all the creation, all brought into being by the same creative agency, and all under a responsibility thus both filial and fraternal—is what modern science every day sees more and more clearly to be indeed strict fact. All the creatures, of which we are but one, *are* brotherly components in the one whole of Nature. We share a grandfather, so to speak, with owls, and with the striped dace that swims in the creek. We have a family link with the oak tree that towers on the hill. We are the brother of the weasel, and the brother of the nuthatch, and the brother of the dark moss that grows on the stone in the forest.

This is the One World, I think, of which we need to make acknowledgment.

Though it comes naturally to primitive men to sense it, and comes clearly to scientific men to discern it, the rest of us as we go about with our necessary self-preoccupations can only too easily forget that it is true. We need to re-awaken our realization. We need to rekindle our sense of the community of all that is created. We need to restore ourselves to the brotherhood



of that One World which has brought forth alike birds and beasts, and trees and soils, and waters and planets, and our related selves.

Why?

What good is to come to us from this experience of brotherhood? What, as the hard phrase goes, is in it for us? Well, I think chiefly there are three kinds of benefits that can accrue to us.

The first is a purely practical consideration. The natural world, after all, is where we live. It is our home. It is where we must get our food, and where we must get our shelter, and where, also, we must get those glimpses of beauty and those experiences of the joy-of-life that are also an essential and necessary support to us. Forgetting our brotherhood with trees, we have so rapaciously assaulted the forests that now there are perhaps a hundred million acres of land that have been despoiled beyond reclaim. We have brought about the extinction of our brothers the passenger pigeons; we have killed from the earth our brothers the eastern elk, the heath hen, and many another; we have brought a score more species of our brothers to the edge of vanishing forever. We have depleted that brother of ours, the body of the waters under the earth. In so far as we have done all these things, we have made the created world just that much the less a pleasant place to live in now, and just that much the less capable of giving us the maintenances we need. We have made our home, by just that much, less lovely for living in; and we have gone along a way that, in time, could make it impossible for us to live in it at all. A respect for all our brothers—a respect for the unity and interconnection of all the creaturely world in which we must live out our days—can bring us benefit in the terms even of the strictest sort of material practicality.

Then there is this second benefit that can come to us from the cultivation of our sense of the general brotherhood of Nature. Reawakening or enlivening our family-feeling for all our fellow-creatures, it can send us outdoors to watch them and study their lives and participate in their adventurings under the sun

and the moon. We are a bored lot, most of us. And we are an indoor-stifled lot. There can come to us an enormous refreshment if we are led to take a vacation, every now and then, from the houses and the offices and the confining preoccupations that imprison and obsess us, and return for a while to the world of sunlight and air and woods-scents and field-scents and bird-songs, which once upon a time was our native world, our primal home.

After all, we are just as much creatures of the earth as woodchucks are, no matter how tightly we may insulate ourselves with air-conditioned walls. After all, it is a native and natural thing to us to

stretch our muscles, and to sniff the wind, and to go shinnying up a tree and to go diving into cool water. Our brotherhood with all the animals and all the elements reawakened, we are led to do those things. We are led to meet our brother woodchuck, and really have a look at him. We are led to meet our brothers the birds, and really investigate how they go about the business of their living, under our common sun. There is opened to us a larger world of knowledge, to make us a little wiser and a little more intelligent, and there is opened to us a wider world of entertainment, to cure our cloistered boredom. They are benefits worth our securing.

These are practical goods that a stimulated awareness of One World may bring to us. Then there is this third good;

and it is perhaps the most important and consequential of them all.

With the expanding of our life-view to see all the creation as a linked brotherhood, there comes to us an enlargement of our capacity for sympathy, for tolerance, and for compassion. We cannot realize the implications of our blood-relationship with brother chipmunk and remain isolated in spirit from any of our closer brothers, the human ones. We cannot study and trace the life-ways of birds and mammals and insects, and fail to develop a realization that there are all sorts of different ways of living in this creation, and that understanding is a wiser thing than censure. To understand and espouse the concept

My Nature Creed

I BELIEVE in the out-of-doors as my garden; the wild flowers of the field, trees of the wood, the mosses and flowerless plants of the by-ways are for me to enjoy.

I believe in the music of the birds, and the strength that comes from the hills in the silence of the night.

I believe the beauty of the world is in the eyes and ears of the beholder; the dainty cut fern and clear, full song of the wood thrush are one, since each is a form of beauty.

I believe God is ever near man, as I can hear Him in the call of the chickadee, and see His handiwork in the colors of the mountainside.

I believe, to be happy and free, we must respect all life, that those things which are our heritage may be enjoyed by our children.

Lastly, I believe—since this is my creed—that it is my duty to teach, especially the children, that they may learn as they follow the long brown path to find the peace and contentment that others of Great Faith have found.

EDNA HEWES MCMURTRY

of One World is to be made to feel, in the simplest and healthiest and most fundamental sense, what can only be called a kind of primary piety. We cannot come to know the brotherhood of all the earth without com-

ing to have something like an enlargement of the spirit.

In a dark and difficult day, I think, we could have no more invaluable experience.

Nonchalance in Feathers

By IRENE STANLEY

A Bird Quiz

1. What bird found in tropical seas was given its name because of its stupid tameness, especially on its nesting grounds? A. Dodo; B. Cuckoo; C. Booby; D. Sea Duck.
2. What native of South Africa and devourer of reptiles received its name from a fancied resemblance of its erectile crest to a pen held behind the ear? A. Pheasant; B. Snipe; C. Secretary Bird; D. Snake Bird.
3. What bird, extinct since 1844, was the only sea bird in the northern hemisphere that couldn't fly? A. Great Auk; B. Barnacle Goose; C. Dodo; D. Moa.
4. What American perching birds are noted for their skillfully constructed bag-shaped nests? A. Orioles; B. Bluebirds; C. Weaver Birds; D. Phoebe.
5. What is the largest of the living birds? A. Cassowary; B. Emu; C. Ostrich; D. Moa.
6. What handsome bird, the national emblem of Guatemala, was so highly prized that at one time only chiefs were permitted to wear its plumes? A. Peacock; B. Quetzal; C. Eagle; D. Phainopepla.
7. What large land bird of the stork family, found in Asia, a true scavenger, has a walk reminiscent of a military man? A. Kingbird; B. Adjutant; C. Rhea; D. Vulture.
8. What web-footed swimming birds fly in V-shaped companies? A. Geese; B. Grebes; C. River Ducks; D. Yellowlegs.
9. What Australian bird builds a structure for amusement purposes during mating season instead of for nesting purposes? A. Ovenbird; B. Umbrella Bird; C. Blue Heron; D. Bower Bird.
10. What perching birds are noted for their habits of impaling small birds and mice on thorns, leaving them to be eaten later? A. European Ravens; B. Shrikes; C. Kingfishers; D. Starlings.
11. What group of circumpolar grouse changes its plumage from black or brown in summer to white in winter? A. Ptarmigan; B. Penguin; C. Bobwhite; D. Ruffed Grouse.
12. What birds were used by the Saracens during

Sparrow,
do orders mean
nothing to you? That sign
on which you perch reads plainly: "No
parking"!

By ELIZABETH EICHER

- the First Crusade to carry messages to their armies? A. Skylarks; B. Pigeons; C. Jackdaws; D. European magpies.
13. What birds are the smallest, most active, and most brilliantly colored of all feathered creatures? A. Birds of Paradise; B. Wrens; C. Hummingbirds; D. Motmots.
 14. What wild species of duck has been the parent from which most varieties of the domestic duck have originated? A. Teal; B. Canvasback; C. Scoter; D. Mallard.
 15. What large diving bird, scarcely able to walk on land, has a weird cry resembling the scream of a human being? A. Sandpiper; B. Bittern; C. Loon; D. Coot.
 16. What nocturnal New Zealand bird possesses no visible wings or tail? A. Kiwi; B. Grebe; C. Hoopoe; D. Nightingale.
 17. What large sea duck, a native of the northern oceans, is famed for its gray down so useful in bedding? A. Widgeon; B. Grebe; C. Shoveler; D. Eider.
 18. What Australian male bird has tail feathers that remind one of a musical instrument? A. Cockatoo; B. Lyre Bird; C. Macaw; D. Trogon.
 19. What gregarious birds, extinct since 1914, had vast nesting places, one of which near Shelbyville, Kentucky, was 40 miles long? A. Heath Hens; B. Rooks; C. Passenger Pigeons; D. Murres.
 20. What nocturnal bird of prey feeds on small mammals and birds, the bones and feathers of which he later disgorges in the form of "pellets"? A. Nighthawk; B. Owl; C. Cooper's Hawk; D. Condor.
 21. What American songbird is noted for its ability to imitate the songs of other kinds of birds? A. Meadow Lark; B. Goldfinch; C. Bobolink; D. Mockingbird.
 22. What bird, introduced into Europe in the 16th Century, is the only domestic animal contributed by the New World that is in wide and valued use outside of its native region? A. Turkey; B. California Quail; C. Canary; D. Guinea Fowl.

(See page 157 for answers)

Balds

By W. L. McATEE

NEAR or at the tops of many southern Appalachian Mountains are essentially treeless areas varying from less than an acre to—in one instance—a thousand acres in extent. Those grown principally to grass are called “balds” by the local people, and those covered with shrubby vegetation, which appears shiny in the sunlight at a distance, are named “slicks.” Although some visiting scientists have written of these tracts as mountain or subalpine meadows, the word “balds” has been widely adopted. They are ancient features of the mountains and apparently were used by the Indians for hunting and camping grounds. In time, they were appropriated for the same purposes by the whites, who found some of them also excellent sources of blueberries, and who grazed large numbers of sheep, cattle, and horses upon the grassy openings.

Some think that use by man made and kept these areas treeless, one author going so far as to call them expanded trails. In this region of luxuriantly growing forest, however, trails tend to close over, not to enlarge. Again, it has been suggested that these openings were made by Indians to lure game, which they might shoot from the deep shadows of the surrounding, dense, coniferous forest. That notion would not have been advanced by a student of wildlife, who would be aware that such forests have no wealth of game, or indeed, of any animal life. Being dark, they support little undergrowth, hence are practically foodless. Left undisturbed, the openings might be productive of certain types of game, which would resort to the margining woodland for cover, but there would be no flow of wildlife either to or from the relatively inhospitable evergreen forests.

Grazing and the associated trampling tend to prevent encroachment of woodland upon the balds, but pasturing did not make these openings; they existed long before the domestic stock of the white man was on this continent.

As to other man-associated causes, there appears to be no evidence that tree-cutting was responsible; the balds were on the mountains before the lumberman. Fire, which can be either of human or natural origin—that is, from lightning—may have played some part in keeping existing balds open, but the



A bald in the Great Smoky Mountains. Many theories exist as to the cause of such areas.

NATIONAL PARK SERVICE PHOTOGRAPH

evidence seems to be that it did not form them. Where either lumbering or fires have occurred in historic time, the blighted areas have not remained open but have been reoccupied by trees.

All things tend to suggest that the balds had a natural origin, but what? Some early writers attributed them to sweeping winds, and others to ice-storms, eliminating the trees. Again, however, where the results of wind-throw and sleet have been observed, the forest has renewed itself.

One author supposed they might have been caused by drought and drying winds that would kill forest tree seedlings. True, some of them

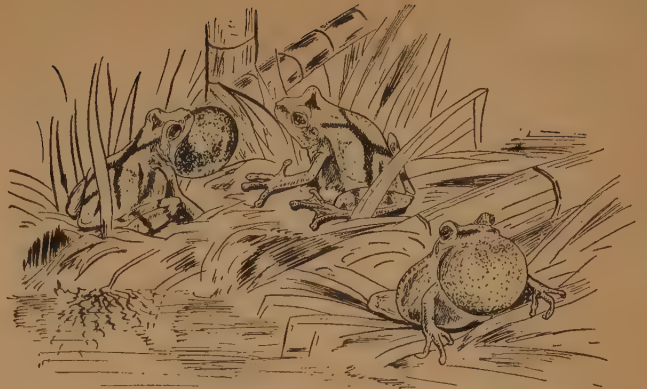
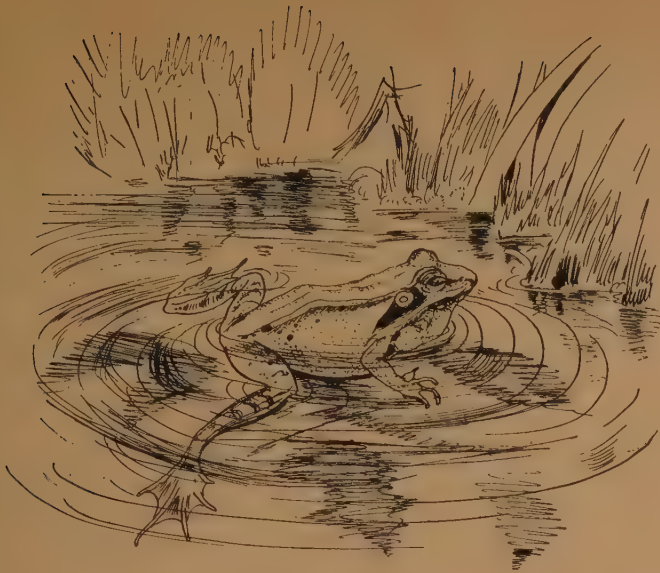
are on south-facing slopes but others are not, and, when invaded by shrubbery, alders are the first to come—proof that there is plenty of moisture.

Another hopeful explainer suggested concentrated attacks of oak-twig gall-wasps that killed the trees, which have not yet been replaced. But there is no evidence that these tracts were ever occupied by oak forests.

The balds have been little compared to the mountain parks, deer parks, prairies, or, in small sizes, “holes,” of the Rocky Mountain region. Some of the larger of these western openings comprise hundreds of square miles, so manifestly are not expanded trails or other works of man. Theories as to the formation and maintenance of the lower-lying, ordinary prairies seem not to have been applied, although the grassland vs. woodland struggle involved would seem similar.

Anyway, one of the latest students admits that the problem of origin of the balds is not yet solved. While the savants are more or less fruitlessly arguing, one may be at least entertained by the explanation of the Cherokee Indians who supposed that the bald spots must be the prints of the horrid feet of the Evil One as he walked with giant strides from peak to peak.

Old-field Mountain, North Carolina, is named for its bald, which by Indian tradition was Satan's bedroom. Although forbidden territory, it was once visited by one of the tribes. They forced a way through the bordering thicket and rejoiced as they entered the bald, or bed-chamber. Aroused from his sleep, Old Harry was enraged and, assuming the form of an immense snake, attacked the Indians and swallowed fifty of them before they could escape.



The spring peeper, one of the best-known heralds of spring, sings a high-pitched "peep! peep!", while the eastern wood frog (left) swims on the surface of a pond and calls with explosive "cluck! cluck!", which somewhat resembles the clucking of a group of hens.

Voices of Spring

By ROMEO MANSUETI

Illustrations by the Author

ON A cold afternoon in early March in our middle states, a swampland is as mute as an impenetrable cavern, but not for long! Soon the stillness is shattered by several explosive croaks. These sounds seem tentative at first, but soon the staccato "cluck! cluck!" picks up momentum and blends into a full-sized chorus. At this sign, spring is officially here.

If spring seems a little dazed from her final bouts with winter, frogs and toads will soon encourage her with exuberant singing—with peeps, groans, croaks, trills, and clucks. For these amphibians are the true heralds of spring, taking the stage and holding the limelight in the symphony of Nature until the spring migration brings birds from the South.

The eastern wood frog's harsh croaking can hardly be classified as a melodious spring greeting. Yet Nature has given this frog the honor of ushering in the spring season, with a call that resembles the clucking of a group of hens or the sounds made by a teamster urging on his horses. The wood frog produces three or four explosive clucks in rapid succession—usually while swimming on the surface of a pool or pond—by violent contraction of the stomach and chest muscles to force air into the vocal sacs.

Spring has a most stimulating effect on everything that is alive, and speedily brings the male wood frogs out of their hibernating places, to seek the nearest pool of water. One male begins his clucking; others join; soon the females, heavy with eggs, hear the calling, and hop to the pond. There is much activity in the vicinity of the wood frog congregation, and often males may be seen "wrestling" with each other, presumably for the spring favors of the single female.

The neophyte herpetologist who wishes to trace down every call that comes from a swamp or marsh in spring may have trouble identifying the species that are singing. Lured to a transient pond by a clucking chorus in full swing, he may be dismayed when the hoarse calls suddenly stop. Only surface ripples now betray the singers, but after a few minutes of quiet a snout emerges, then the rest of a three-inch frog. But, defying all attempt at capture, the frog eludes one by sinking beneath the surface or hopping rapidly across the pool.

At nightfall, the chorus rises in intensity and the frogs become bolder. With a flashlight beam cloaked with red cellophane, one can more easily observe them. Then they are less difficult to approach, and after a lunge with our hands in the water, a squirming wood frog may greet us with its typical "laughin' face" and large, almost popping eyes.

This fellow is brown, with a dark, prominent stripe beginning at the nostril and extending back to the shoulders. The lips are marked with a lustrous yellowish line. It is one of the handsomest of North American frogs. At singing time, the lateral pouch is inflated on each side of the throat and shoulder region, swelling slightly, but the vocal pouches are not as conspicuous as in some other species. Indeed, the wood frog is said to have no true vocal sacs, but the throat and chest are inflated markedly for about a second with each sudden reproduction of sound. Males can be seen floating on the water's surface, with hindlegs outstretched, croaking with their one or two-syllabled, grating note. The explosive calls are emitted singly, or two to four at a time, at intervals of a little less than a second, depending on the humidity, tempera-

ture, or even the activity with females or other males.

The wood frog's breeding period is not long, usually not extending over a week for each congregation. Often they breed so early in spring that they are found swimming beside ice, or even found calling in below-freezing weather. The females promptly lay their eggs, crowded together in one section of a pool, and finally move back to the woods. The gelatinous masses of eggs are conspicuous in the water, and, despite the fluctuations of temperature, they develop rapidly. By June the young are fully transformed, and myriad are observed hopping around the edges of the pond.



The striped chorus frog is well known for its voice, but manages to stay hidden from human eyes. Its stuttering trill may be accompanied by the serenades of the wood frog and the spring peeper.

One evening, not long after our discovery of the wood frogs, we notice that the soft breeze that carries the odor of skunk cabbage from the swamps brings along a distinct, loud "peep! peep!" Another rainy evening causes more peeps to issue from the swamps. Soon the mud puddles, ponds, and transient bodies of water in the forests and meadows resound with the high, squeaky notes. These come from what is frequently the second official broadcaster advertising that spring is here.

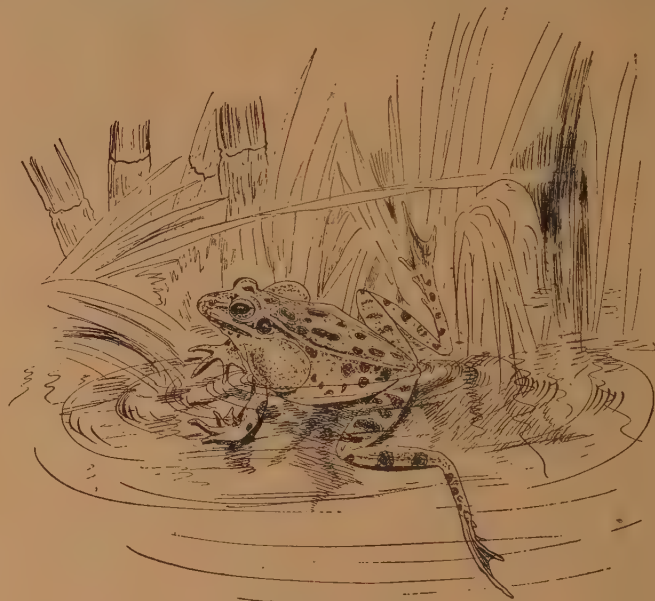
A superficial examination of the water areas reveals nothing; even a much closer look yields no life. Our awkward and noisy searching silences all the frogs around us. We must dig up patches of grass and debris from where the sound is coming, until a tiny object jumps in short hops for the water. A quick grab brings in a handful of wet grass and a struggling frog, its throat partially inflated under the chin like a piece of blown-up bubble gum.

It is the spring peeper, a common tree frog, better known for its voice than any other kind of frog in the United States. It is easily identified by its dark, cruciform pattern on its brown or tan back, and a dark triangular spot on the head between the eyes. The toes are provided with tiny, adhesive discs on the tips, a

feature typical of many hylids. Despite its suction pads for climbing, the spring peeper spends most of its life among grasses and on the woodland floor, rarely climbing above six feet. It is often found hopping from one herbaceous plant to another, and it climbs up perpendicular cattail reeds with apparent ease.

It is inconceivable to many people that such a diminutive frog—its maximum length is about one inch—can produce such a volume of sound. Still more astounding is the fact that it is actually a frog that is producing the peeps. During the daytime, most spring peepers are hard to find because of their habit of serenading while partially submerged under the protection of mats of grass and leaves. At night, however, a male peeper is a bold, lusty singer venturing to peep on piles of debris. Hunting peepers at night is exciting, and they appear fearless in the rays from a flashlight.

The beam of your light catches one frog in the act of inflating his sagging fold of loose skin on the



The leopard frog's harsh, low, explosive croaks dominate a pool of water in April, and are produced with much force. It can be mistaken for the pickerel frog, but differs in markings and songs.

throat. It rears back as the throat assumes the shape of a creamy bubble. The gold-flecked eyes sparkle, reflecting the light. Each peep is a shrill, high-pitched, one-syllabled call. The carrying power of the calls is such that a sizable chorus may be heard for more than a mile. During the peeps, the frog has the mouth closed, but with every call the bubble under the chin pulsates rhythmically, enlarging slightly. At the end the throat collapses and the frog rests from his noisy serenade. After a few moments, he resumes the song, assuming a forty-five-degree angle, filling his lungs with a deep breath, and then allowing the air to enter the vocal cavity, which acts as a soundbox and magnifier.

On early, cold March nights freezing and thin ice

will often not stop the peeper's effervescent singing, although three or four nights of below-freezing temperature may shut up even this hardy frog completely.

The purpose of the singing is to attract a mate, and after and during the serenading the males fertilize the eggs as they are ejected by the female. As a rule the eggs are attached to objects such as twigs, grasses and other aquatic plants, singly or in groups in the water.

These two heralds of spring, the wood frog and spring peeper, although differing structurally in their external singing apparatus, basically have the same type of vocal cords. The larynx contains elastic mus-



Fowler's toad is often mistaken for the American toad. The voices differ, however, Fowler's calling with a short, metallic drone, while the call of the American toad is a sweeter, higher-pitched trill.

cular cords that can be set into vibration by air forced from the lungs into the vocal sacs situated at the sides of the neck or at the throat. The pitch of a frog's serenading is varied by changing the tension of the cords. The spring peeper has a median vocal pouch on the chin, as do all other species that inflate their throat sac, but the wood frog possesses a paired vocal pouch, which is connected with the mouth by round openings. Vibrating air passes into and distends the pouches, which in turn act as resonators to amplify the sound. The call of the spring peeper is a series of shrill whistles in a high pitch, approximately two octaves above middle C. The highest pitched whistle that can be produced by a human simulates closely a "peep." A single whistle made by the spring peeper lasts less than a second, and is followed by about fifteen similar notes in about as many seconds. There is some variation in pitch in a typical chorus, and an occasional trill may be heard, but this is attributed to climatic conditions and the "emotional" situation in which a frog may be at that moment. The wood frog croak is lower in tone than most of our frogs, but the carrying power is not as strong as the call of the spring peeper.

Why these frogs leave their hibernating sites, *how* they "know" *where* to go in order to propagate their species, and *what* causes them to sing lustily for a few

weeks and then quiet down for another whole year has always perplexed students of amphibians. Much is known concerning the phenomenon, but more is left unanswered.

In the spring peeper and wood frog, as in other frogs and toads, the internal sensitivity to humidity is controlled by the seasonal over-development of the organs of reproduction, the gonads. In turn, these are under the control of hormones, especially those released from the anterior pituitary gland, a very important organ controlling the life processes of an animal and found at the base of the brain. Heavy spring showers usually initiate the loud calling of thousands of frogs over the countryside. But, before this occurs, a climatic change in spring is the final releasing factor in causing these frogs to desert their hibernating sites to breed in the water. Thus a sudden increase in humidity is a decisive factor.

Why does the spring peeper or wood frog emerge sooner from hibernation than any other frog? It is thought that the migrations of many amphibians are controlled by rhythms, which are, in turn, determined



The common tree toad is the sophisticated member of the tree frog family, best known for its reputed forecasting of coming rain by its musical trills.

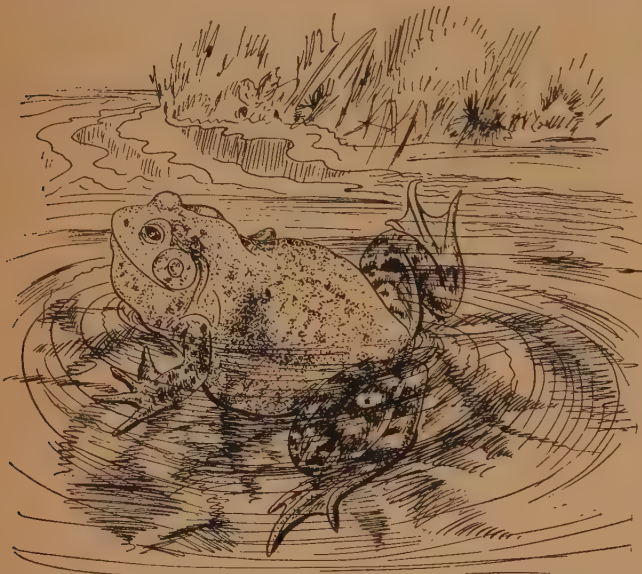
by climatic changes of previous seasons. These rhythms, as suggested by recent endocrine studies, are directly controlled also by hormones released from the front lobe of the pituitary. In the laboratory, for instance, biologists have been able to induce both frogs and salamanders to lay their eggs out of season by treating them with fresh anterior pituitary substance. This hormone release is probably under nervous control.

Amphibians breed in a great variety of situations, each species usually having a distinct habitat preference. In finally reaching these places the migration urge is correlated with the various structures that develop in spring, such as swelling of the male frog's thumb, a stouter forearm, and the use of the vocal apparatus in the male sex. The gonad hormones released at this time probably account for the special

"sense" in the final movement to the breeding sites.

The most important factors, of course, during the spring movement are the voices of the males. The first males that happen to reach suitable breeding grounds begin their calls. Soon other males, and, later, females, are attracted by the sounds to the same spot. As in birds, we frequently note that the breeding territory is marked out by a group of male frogs of one species, and calling stations are selected in order to alter or direct the migration route, or at least the path of an individual as it nears a breeding site.

The abdominal muscles of male frogs have an important function in forcing air from the lungs in pro-



The familiar "chug-o-rum" of the bullfrog resounds resonantly across a swamp or from a river from early May to midsummer

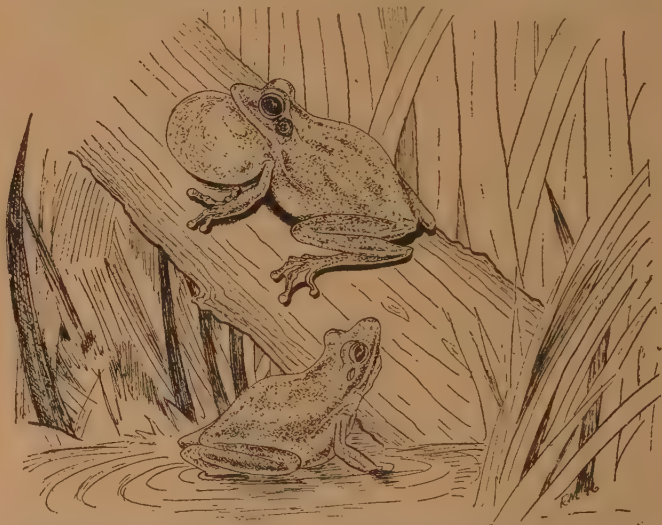
ducing the call, and are correspondingly more powerful than those of the larger female. The lungs of male frogs are larger than those of the female, and this may be correlated not only with the louder voice, but also with the higher metabolism and greater activity of the male.

Associated with the spring peeper and the wood frog in early spring, when the silvery pussy willows are bursting out of their buds, is the tiny striped chorus frog. Many people have heard this creature, but few have ever seen one alive in a swamp or marsh. Its voice stands out distinctly from the calls of the spring peeper, and it often sings from the same pool of water at the same time. Occasionally the striped chorus frog awakes earlier than the spring peeper or wood frog in the swamps or woodlands. It has even been heard in December and January on warm, humid days. In waterhole-dotted fields adjacent to an airport in Baltimore, the chorus frogs' drawn-out, musical, high-pitched trill, which arises in pitch and intensity toward the end, seems to equal the volume produced by the spring peeper. The striped chorus frog, however, cannot rival the spring peeper's call,

either as an individual or while singing in a chorus, even when great numbers of males call incessantly in their peculiar stuttering or rattling trill. You are definitely aware of the calling of this frog, since it is a quite distinctive trill amid the spring peepers' "peep" and the wood frogs' "cluck." The intensity of the calls is dependent on the fickle March winds and the humidity.

Although striped chorus frogs call during daylight hours, they are extremely difficult to approach, and they usually discontinue singing abruptly if we approach too near the breeding sites. If we remain motionless and silent, an individual frog here and there will break the silence and soon the whole chorus will join, but the slightest move or noise will break the spell. To the uninitiated, the chorus frog's loud call suggests a large animal; and the discovery of this small frog is a big surprise to every budding naturalist.

At night the chorus is more insistent and less wary; only those frogs in the immediate vicinity of our hip boots cease their singing. If we remain still, they continue their trills. By flashing the light on the grassy edges of the pools, one can easily recognize the males by the bubble-like throat, several times the size of the head, vibrating at each trill. Between calls, the



The "quonk, cronk, quank" of the green tree frog is usually one of the most characteristic sounds in favored marshes on a June night.

throat is only partially distended. When grasped, the frogs will struggle vigorously and completely deflate the throat. However, if placed in a jar, their short memory and amorous ardor will incite them to trill loudly, this, in turn, keeping those around us singing. These frogs are heard occasionally during autumn, but in summer they are seldom detected.

In April the calls of two spotted frogs dominate the scene of a temporary woodland pool. The leopard frog is the first of these, and is recognized by its harsh, low, explosive croaks. At night the leopard frog can be identified by its distended vocal sacs, which extend above each front leg over each shoulder. These bubbles, which originate at the (Continued on page 162)

Snail Hawks

By HUGO H. SCHRODER

Photographs by
the Author



A male Everglade kite lands near the site of the nest. The bird derives its popular name of snail hawk from the fact that it lives on one species of snail. Here we see the sharply hooked beak with which the kite is able to get at its destined food.

THE Everglade kite, more familiarly known as snail hawk, is an outstanding example of what may happen to a rare bird dependent on only one kind of food when that food supply becomes unavailable. This kite's sole diet is the big fresh water snail, *Pomacea caliginosa*, once quite abundant over large areas of marshland in the Florida interior.

Drainage of the extensive marshlands where these kites formerly resided, plus long periods of drought, which killed the snails, have reduced seriously the regions where the birds could find their snail food. Today the kites seem to be making their last stand on Lake Okeechobee. Certain sections of this large lake are quite like the marshlands, with shallow water and an abundance of typical marsh vegetation. *Pomacea* snails live there in countless numbers. In spring, clusters of the pearl-like snail eggs are much in evidence on the plant stems above the water line.

It is doubtful if any Everglade kites are to be found in the Everglades today. And the small numbers now remaining around Okeechobee are waging a losing battle for existence, for the hand of man is against them in other ways than just the matter of drainage. They are shot because they are "hawks". Their eggs are sought by egg collectors because of their rarity. And some skin collectors may not hesitate to take specimens while they are still available.

Everglade kite eggs have long appealed to the collector, whose ambition was to have one or more sets in his cabinet, or for use as trading material for other rarities. Fortunately, however, private egg collections are not as numerous as they were before restrictions were placed on such collecting.

The National Audubon Society has maintained

wardens in the Okeechobee area for some years. Their presence during the nesting season undoubtedly deterred collectors from invading the kite colony, yet the area covered by the warden was much too

large for complete protection. Some years ago I accompanied the warden on a visit to a small kite colony, finding that all the nests in the tall rushes had been emptied of their eggs. No birds were seen in the localities where their nests had been.

Perhaps the greatest danger to the present small Everglade kite population on Lake Okeechobee is the duck hunter. Many hunters are unable properly to identify any hawk or hawk-like bird; all are classed as "chicken hawks", or just "vermin". Too many duck hunters still believe that every owl, hawk, or hawk-like bird should be killed on sight, mainly because they have never learned that there are beneficial birds of prey, and that the beneficial species outnumber those that could be called harmful by prejudiced individuals. And ignorant killers do not know that the Everglade kite eats nothing but fresh-water snails of one species.

Some progress has been made in educating hunters regarding the food habits of the hawks and owls. The National Audubon Society has prepared pamphlets describing the food habits of the Everglade kite, telling of its rarity, and appealing to the hunters to stop their slaughter. This information was distributed to ducking camps, hotels, stores, and to individuals in the Okeechobee region.

But Everglade kites are still being used as targets for the guns of the hunters. If ducks are scarce, some hunters blame it on the hawks; they shoot every hawk they see. Some few hunters still cling to the notion that if a bird is not good to eat it is not good for anything else. So they shoot at everything, just to keep in practice, or just for the sake of killing.



An Everglade kite in flight,
showing its wide spread wings.

I was recently told about the discovery of three dead kites in front of an Okeechobee duck blind, after the hunters had departed. No doubt these hunters complimented themselves for killing a trio of potential duck killers! Three snail hawks killed in one day make a big difference when there are perhaps less than one hundred of these beautiful birds still remaining in Florida. Individual kites killed by hunters are found all too frequently.

All these hazards, together with the natural hazards of any bird in the matter of survival, have made it difficult for the few remaining birds on Lake Okeechobee to maintain even their pitifully small numbers from year to year, and in the face of hunting.

My first glimpse of the Everglade kite was in the St. Johns River region on the Melbourne-Kissimmee highway. In bygone days the kites found the extensive marshy regions along the St. Johns well stocked with the snails they used for food. Many nesting sites were available in the low shrubbery growing in the marshes. The birds had been nesting there regularly for years before I saw one of the kites as it flew over the roadway. And it was two years before I saw another kite, the last one I saw there.

Three young Everglade kites photographed in their nest at Lake Okeechobee, Florida.

Extensive marshes covered a large area west of Vero Beach, Florida. Exactly one year after seeing my first kite, I visited these marshes in the hope of securing photographs. I found numbers of snail hawks coursing over the marsh as they foraged for food. Each snail was carried to a favorite perch, where the kite used its hooked bill to extract the juicy snail from the shell, then discarded the latter. Two other kites were perched in the same tree, and a fourth came to join the others at the community dining place. Time after time these four sallied forth to search for snails.

Heading our boat in the direction of the kites, we watched them for a considerable period as they captured snails and carried the food to their perch. They flew low over the water, quite as the marsh hawk conducts its foraging flights. None of the birds came within camera range, and the dining place was too distant for successful photography. But just watching the kites was enough.

Froggers plying their trade in the larger marshy areas in the past came to know the snail hawks and their food habits, for frogs and kites inhabited the same regions. Some of the froggers made extra money by collecting Everglade kite eggs for out-of-state collectors. When froggers reported the disappearance of kites from their former nesting grounds, their reports were usually authentic.

During the last decade, apparently, all the Everglade kites had deserted their former nesting regions and moved to Lake Okeechobee. While before that snail hawks were still to be found in various regions, I never saw more than a few at one time, therefore it





A male Everglade kite landing on a slender twig near the nest site. Here we see the full expanse of wings, with the widely separated tips of the primaries and the band across the base of the tail, a characteristic of this bird that assists in identification.

was a real thrill to see twenty-seven kites in the air at one time over a nest colony where ten nests were observed. The nests were in willows at about eye level or a little higher. Some still held eggs, while others contained small young. The water was two to two and one-half feet deep around the nest trees.

I had two cameras with me—a Graflex and Rolleiflex. It was impossible to get above the nests in the low willows, but by inverting the Rolleiflex over my head I managed to secure photos of a nest with eggs and some with young. It was the first time I had seen either eggs or young snail hawks. And I have never seen either since that eventful day in 1941.

My efforts to secure flight photos of the kites on the wing did not meet with much success because the birds were usually out of camera range, or foliage

interfered with photography. A number of flight shots, however, showed a variety of wing positions. Once I managed to film two birds close together as they flew over the nest trees. One male kite obliged with several interesting flight poses as he landed.

It was truly my red letter day for Everglade kites. I had seen the first nests with eggs, the first young kites, and the largest number of birds observed at one time—perhaps the largest number I will ever see. And I had secured my first, and only, photographs of this rare species.

Everglade kites are desperately in need of complete protection if this remarkable bird is to be saved for future generations to enjoy. Let us hope that it will never be necessary to change the listing of the kite from vanishing species to that of extinct bird!

Backyard Burbanks

By ARTHUR HAWTHORNE CARHART

THE air mail letter, with a foreign postmark, contained an arresting sentence: "A stray pod from the Rocket will be very welcome!"

War censors reading that request would have suspected international intrigue, but investigation of this Rocket would have led to the back yard of a home in Mapleton, Iowa, where Charles and Agnes Whiting live. There, in an area containing half an acre, is the birthplace of the Rocket—a startling new variety of orange iris. But the war had ceased; the letter from one of England's foremost iris fanciers requesting seed of this sparkling new flower came without censorship.

Visitors to the Whiting garden see Rocket and its relatives ablaze with new colors. As they wander grassy paths, callers learn how this little plot of ground, and others like it across the nation, are exploding with new and startling varieties of "the poor man's orchid."

As they leave this tiny spot, pinpointed among sweeping acres of the corn belt, visitors suspect that plant magic wrought there might happen in any home garden, anywhere. It *can* happen. That is the fascinating essence of the story of the Whitings and their little, high-powered "iris factory."

When they took the first step, Charles and Agnes



Charles Whiting grubs in the garden among his iris roots while Agnes Whiting takes notes, essential to success in plant breeding. At the left, one of the Whiting irises.

had no premonition of some day receiving recognition among foremost iris hybridizers of America. Aunt Ella, a neighbor, was leaving Mapleton for a new home in the west.

"If you'd like to have some of my best iris and peony roots," she told Charles, "help yourself."

The offer was accepted. No sensational flowers were included in that group. They were old, standard varieties. With the care they received, they responded with their finest blossoms.

Prof. E. C. Volz of Iowa State College saw these irises at their height of bloom. As the Des Moines Garden Club sought judges for its 1931 flower show, Prof. Volz suggested Charles' name.

As he read the invitation to serve as a judge, Charles said, "I don't know fine points about iris! Why pick me?"

"You'll work with two other judges," argued Agnes. "Bone up on the fine points. Use your eyes and common sense. Of course you'll accept!"

An exhibit of striking new seedling irises at that





The Whiting garden is small—only half an acre—but it has produced irises that have won honorable mention. In May Mrs. Whiting will receive the Gold Medal for Achievement in Hybridizing from the American Iris Society. Only 15 awards have been made, never before to a woman.

show drove Charles to a decision. Growing prize irises would be the Whitings' hobby.

In the beginning, growing irises *was* just a hobby. The garden plot assigned to it contained only about four hundred square feet. The first objective was to grow one clump each of every prize iris available. It was to be an outstanding show garden.

In May of 1932, a new pink iris, Imperial Blush, bloomed for the Whitings. When a seed pod formed they carefully planted the contents and waited. The first blooms unfolded in 1934. The new flowers were all "wild cats and stray dogs"; not a single one was worth saving.

That failure was a challenge. It also drove home to the Whitings that, if they were to have any success, they must approach hybridizing on a studied basis. They purchased more new varieties. They secured "family records" of these parent stocks. They studied books and journals. With so small a plot available, precision in hybridizing is imperative. They had learned this truth.

Charles is head of the town's leading bank. He manages a number of good farms. After the business day closed, he hurried home to join Agnes, clad in earth-stained coveralls, trowel in hand, digging, sorting and jotting records in a little book that would tell the ancestry of every seedling. Then through twilight they worked together on their irises.

"I declare," said a neighbor, "Charley Whiting is putting more time on those pet irises than his farms!"

Two years elapse between the planting of iris seed and first blooms. Then come days of high anticipation. Many seedlings are disappointments. They lack distinctive color; or substance in bloom; or good habit of growth. These are relentlessly discarded. But just one seed out of one pod may come close to producing what was planned when the cross was made.

Luther Burbank, a pioneer in popularizing plant breeding, kept none too voluminous records. He relied mainly on selecting one or two promising varieties from a vast array of seedlings. But modern plant breeders plot their moves with all the aids science can supply. Like master artists mixing pigments on a palette, they blend parental characteristics to achieve defined results. A few hundred seedlings produced through this systematic approach assure a greater chance of success.

It was 1938 when the Whitings saw one sturdy seedling's first rich-yellow bloom, and realized that they had something with merit. The roots were carefully divided and replanted. Jake Sass, a noted iris breeder, saw this new variety in 1939.

"It's plenty good," Jake said. "Introduce it next year!"

The new iris, named Golden Spike, was displayed at the next national iris show. It scored an "*honorable mention*" the first time shown. In 1941 this iris bloomed in gardens of at least six of the leading iris fanciers. One of these was the famous Fishburn Garden at Roanoke, Virginia. The Whitings were among

the guests at a house party in the Fishburn home following an American Iris Society meeting. A thrilling moment awaited there.

"When we arrived for dinner the first evening," Agnes relates, "a toast was drunk to Golden Spike and its originators. After dinner a flashlight party went to the garden to see it blooming—the first time in a celebrated garden, and away from home!"

The opportunity had come; the hobby began to produce results. By 1945, when the American Iris Society awarded thirty-four "*honorable mentions*," Whiting irises received five and, now, a gold medal.

Even before the war, orders had been received not only from American iris fanciers, but from across the seas—England, France, Australia and other countries. The American-born Countess of Senni, with a villa in the suburbs of Rome, Italy, was among the far-away customers.

As war broke, young Jim Whiting joined the Air Corps. Later he piloted his P-40 through dog fights and spot bombings in North Africa, Sicily and Italy. When the war ended Jim came home with decorations and tales to tell. One account concerned the silencing of the "Anzio Express," gun batteries that poured out deadly shells from emplacements hidden in the grounds of a country estate. Jim's squadron had helped stifle those guns.

A letter and an order came from the Countess in Italy. Those big guns had been hidden in a tunnel beneath her garden. American fliers had blasted in the entrances to the tunnels and bottled up the guns. Jim read the letter, and remarked, "That's where we figured the Krauts had those guns hidden!"

By a strange coincidence, Jim and his mates had shattered a garden where prized irises created in the back yard of his Iowa home had bloomed.

During the years war beat on nations and peoples, many iris hybridizers found relief from tensions by working hard among their flowers. In these months, revolutionary results appeared. As crosses were made, the characteristics of the parent irises combined in newly recognized ways to produce fabulous new colors.

In this period, the Whitings suddenly realized that their hobby had become a full-blown business. At first they made fifty to sixty crosses per season. Now they make three to four hundred. Selections they make from five to ten thousand seedlings showing first blooms are increasingly exacting. But such a policy pays.

In the first year they are offered, roots of fine new irises may sell for as much as \$35 to \$50 each. Commercial growers purchase these, and begin building

up stock in sufficient quantity to offer to customers. A few years later, when supply is fairly abundant, roots may sell for a few dollars each, and these beauties find their way into a host of gardens.

What Iowa banker Charles Whiting and his wife Agnes have done is open to anyone who has a garden plot of even limited area. Opportunities lie not only in breeding irises, but in producing new varieties of many other flowers, and even vegetables.

At this time, there is intense interest among amateurs and professionals in producing new "day lilies" or *Hemerocallis*. Gladiolus, lilies, tulips, sweet peas,

snapdragons and narcissus, all bearing flowers of simple structure, are easily hybridized. The techniques are basically the same in hybridizing flowers known as "composites"; chrysanthemums, daisies and others of this type. Composites do demand a little more patience and exactness as flowers are prepared for crossing and then fertilized.

There is a simple routine that is basic if you undertake an adventure in hybridizing. Parents are selected. Before the pollen-bearing anthers of the mother flower are dusty "ripe," they are removed. A little bag is tied over the emasculated blossoms to prevent casual fertilization by wind or insects.

Then, when the pistil of this flower is sticky and ready for pollen grains, which can be observed under a hand magnifying glass, pollen from the selected male parent is dusted on.

After the mother flower is pollenized, the protective bag is replaced, a tag showing parentage is attached to the flower stalk, and when the seed is ripe it is collected and planted, probably with a serial number on a stake to mark that section of the row containing all seeds from a specific pod.

These are the simple fundamentals. Beyond that lies the fascinating field of studying blood lines, so characteristics of one plant may be blended intelligently with another, the excitement of creating something new, beautiful and useful, the selection of seedlings to be saved and the keeping of "the record."

"You've got to keep records!" says Agnes Whiting. "I can give you the complete breeding records on mine or any other prize winners. I have all the dope that has ever been published on any iris that won a prize or came close to it."

Many another home garden enthusiast has done and is doing what the Whitings have done. The story of their hobby that has become a business is merely one striking illustration of what may be accomplished.

With a little plot of garden ground, a liking for gardening, you may engage in a little plant-wizardry of your own. Try it. It is fun. It also may be profitable.

Copper Beech

By ETHEL ROMIG FULLER

The copper beech is rusted brown
With never a leaf to its winter crown;

Yet somewhere, someone stirs huge kettles
Of bubbling, molten, foliage metals—

Not too thick; not too thin—
For dipping copper beeches in.

Let pear buds be honey-swollen;
Let willows gild spring air with pollen;

The lovely tree with the burnished name
Lights a garden with copper flame.

Plant Stars

ASTRONOMERS would tell us that there is nothing edible about the stars, but most of the plant stars in 1948 are distinguished for their edibility. This is appropriate in a year when food is a mighty important thing to the world. Of course, there are novelties among the flowers and decorative plants, as some catalog browsing will reveal. And, to be sure, anything is a novelty until you have tried it out yourself. Liberty Hyde Bailey, at ninety, is still growing new plants in his own experimental plot, and, as one of the world's greatest gardeners, is just as curious about new plants as ever.

Since food is so important this season, it is proper that a string bean head the list of All-America selections. The 1948 introduction is Puregold Wax, a bronze medal winner that Ray Hastings, Secretary of All-America Selections, says is just about the best wax bean to date. And Supergreen, a bronze medal, green bean from 1945, has just been released to the public. This medium-size plant yields prodigiously and is of excellent quality; also Ranger, a semi-trailer, is vigorous, high yielding and good to eat.

Two new peas come next on the list. Developed for freezing, Victory Freezer and Freezonian both are cold and heat resistant, wrinkled, tender and full of sugar. Peerless bush lima is said to be the heaviest-bearing, new, semi-runner type, a bit larger than Henderson and of fine qual-



New Yorker, a hybrid tea rose originated by E. S. Boerner for Jackson and Perkins, sparkling rich red rose with a wealth of bloom. Below, Burpee's Orchid, a new, all double petunia, that grows tall and has blooms of a rich, light orchid color with deep, rosy-purple veins.



By ANDREW S. WING

*Executive Secretary,
National Garden Institute*

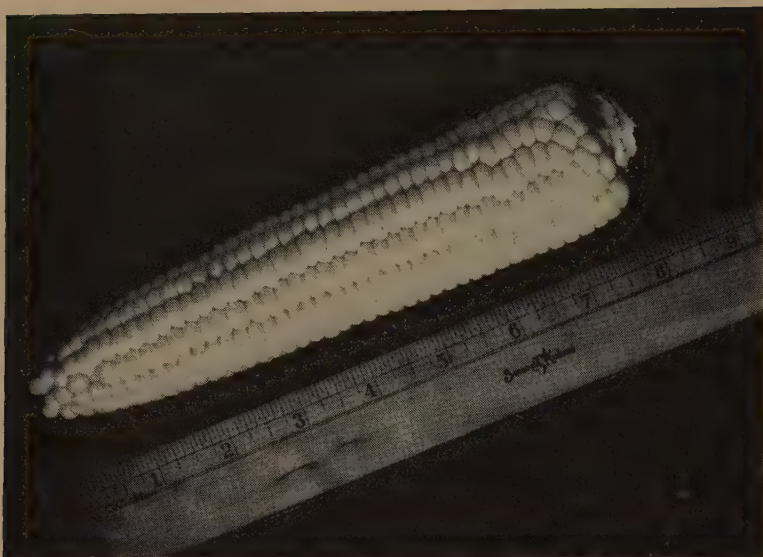
ity. Cherokee, a wax, bush, snap bean, is given special mention because it has good market qualities.

The fragrant onion gets the limelight with a new Bermuda, named Excel, a type that is suited only to the South because it matures late. Two new sweet corns are recommended by Northrup, King—Golden Rocket, a competitor with Spancross and Marcross, maturing in sixty days and with a taller stalk and high quality; and Hybrid Golden Bounty, an improved Golden Cross Bantam type.

Several new carrots are out, including Red Core Danvers by Northrup, King and Danvers 126 of Eastern States Exchange, a farm co-op that is acquiring a fine reputation for outstanding seed strains. The latter also has a new hybrid sweet corn, Golden Rule, that matures in 82 days and is similar to Carmelcross. Other vegetables worth noting are Burpeeana tomato, a new hybrid that bears scarlet fruits in clusters of five to eight.

These are only a few of the worthwhile vegetables of recent origin. Thanks to the enterprise and skill of our great seed establishments, and a host of able government plant breeders, a slow but steady revolution is going on in the vegetable world. Year by year it is easier to grow things in competition with bugs and blights; to have tenderer and more flavorful foods for the table.

A study of several seed



Golden Rocket, a new sweet corn from Northup, King. It matures in sixty days, has a tall stalk and high quality.

as open. Charlotte Armstrong, a winner in 1941, is still rated high; and so is Peace. Rose of Freedom, not quite a winner but a good red, is a new contender for popularity. So are Grace Moore, Anna Marie and Golden Anniversary by Conard-Pyle. The first is a dark red, the second a light rose-pink, and the last a rich old-gold color, flushed with orange at times. Jackson & Perkins, one of the largest of rose growers, offer Diamond Jubilee, Red Pinocchio, New Yorker and Geranium Red, all outstanding varieties. Wayside Gardens gives us Hill's Hillbilly, Hill Top, San Fernando, Pink Rosette, Bright

catalogs, and a careful reading of the advertising announcements of leading seedsmen, will help you to have a better Freedom Garden this season.

This year the All-America flower selections are headed by a cosmos for a change—the first bi-color. It is Radiance, rose pink with a wide band of deep crimson.

Petunias continue to crowd the stage of stars. Pink Sensation is the new Burpee winner, a tall, erect bedding plant with large plain petals of rosy pink. Burpee scores again with a marigold—Red Head, a dwarf bush form that is covered with the single French type blooms, the reddest of all marigolds to date. All these flowers won bronze medals.

There are many other annuals of new or recent introduction. These include a new white larkspur that Henderson is naming in honor of a famous woman golfer, the secret being kept until the New York Flower Show. Burpee and others offer new petunias, sweet peas, snapdragons, and, of course, numerous marigolds.

It is time for someone to do something with sunflowers, or bachelor's buttons, or chicory. The last is one of our finest blue flowers and should not be neglected simply because it is a roadside weed and an occasional pest in lawns. In England, it is said that our common mullein is grown in gardens as the "Great American Velvet Plant!"

When we come to roses and other hardy plants, there is as usual a galaxy of brilliant stars from which to choose. The All-America roses are Nocturne, a glowing cardinal red with long stems, and black at the base of the petals; Taffeta, a blend of soft red, salmon, peach and yellow—beautiful in bud as well

Eyes and Rosy Morn. Wayside also offers a new lilac, Clarke's Giant, a large plant with huge trusses of fragrant, soft, gentian-blue flowers; a new anthemis, Golden Dawn; a Norway maple, Crimson King, with foliage similar in color to that of the copper beech.

In addition to roses, Jackson & Perkins feature two new delphiniums, Glorious, which is described as a "boisterous royal purple," and Pink Sensation, a Dutch importation that is a real pink and produces three crops of bloom a year.

Specialists in lilies, irises, dahlias and gladioluses have not been idle, nor have the growers of narcissuses and other bulbs. Beautiful new varieties appear at every large flower show, and it will be worth your while to study the catalogs of the leading specialists for these.

I have not noticed anything particularly new or exciting among the fruits. But steady improvement is being made in many species through the work of skilled hybridizers. Blight-resistant chestnuts are just beginning to take hold with the public, and are now offered by several nurseries. In Connecticut an attempt is being made to (Continued on page 161)



Burpeeana, an early hybrid tomato that is new for 1948, the fruits coming in clusters of from five to eight.

More than a Waterfall

The Story of White Oak
Canyon Nature Trail, an
Experiment in Nature
Education

By BERNARD FRANK and
IVAN TARNOWSKY

Photographs by Devereux Butcher



The authors and pioneers of this trail pose beside the sign that marks the start of the trail. They are all dressed up for trail-going.

WHOEVER walks down the White Oak Canyon Trail—Shenandoah National Park's most popular hike—will see at the end of the trail a magnificently beautiful waterfall. Even in dry weather the falls keep flowing. In the hottest time of Virginia's summer the walk down the trail is cool and refreshing, and the goal is satisfying and inspiring throughout the gentle climb along the return trail. Thousands have followed this trail and returned feeling well rewarded simply by the walk itself and the view of the falls.

But there is more to any outdoor excursion than scenery and exercise, and visitors to the White Oak Canyon Trail now have an opportunity to realize that there is more here than a waterfall and a pleasant hike, and much that has an important meaning to everyone. They owe this opportunity to an experiment The Wilderness Society has made in cooperation with the National Park in order to help the visitor guide himself to an understanding of Nature at first hand—to help anyone answer not only the question "What is it?" but also explain the "why" and the "how." Hundreds of people who visited this trail in 1947 tested out the experiment and made suggestions for its improvement. All agreed that if you know what to look for there is more here than a hike and a look at waterfalls.

A common question has been: "How did this start?" And its origin does seem significant.

The idea was first advanced by Benton MacKaye, father of the Appalachian Trail, footpath from Maine to Georgia from which White Oak Canyon Trail leads off on a side excursion. Elected president of The Wilderness Society in 1945, Benton MacKaye began facing the Society's problem of broadening an appreciation of our few remaining wilderness areas. It was no new problem to him, but one that he had already concluded was due largely to the fact that so few had

learned to understand Nature at all. Thus he began anew to think of some way whereby people themselves could begin to read Nature itself, not merely books about Nature—and thus this trail was first visualized.

Soon Mr. MacKaye was writing Edward D. Freeland, Shenandoah National Park's Superintendent.

AS A MODEL for similar projects elsewhere the White Oak Canyon self-guided Nature trail is of considerable general interest. The National Park Service and the U. S. Forest Service are accordingly calling it to the attention of their field staffs, and the American Nature Association has for the same reason arranged to present this picture-preview to the readers of *Nature Magazine*.

The response was enthusiastic. The Park staff, particularly Assistant Chief Ranger Francis A. Moore, and District Ranger Thomas K. Garry, cooperated unstintingly with the two representatives of The Wilderness Society (authors of this "preview") who undertook to carry out the project. Others also gave eager cooperation. Raymond S. Gregg, Chief Naturalist then of national capital parks, made many helpful suggestions. Miss Catherine Landon typed and retyped the project outline. The National Park Service and the U. S. Forest Service gave encouragement. The National Parks Association gave its support, and Devereux

Butcher of that Association made the photographs.

Here on this trail Nature, indeed, has a wondrous story to tell, for Nature itself is like a book to those who care to read. The White Oak Canyon Trail now opens this book at seven of its pages, selected for the particular interest and enjoyment of the "reader."

This picture preview "translates" these pages into the most elementary terms of English. But here are only words and pictures—not the things that the words represent. You know the word "topsoil." Maybe you even know, in words, all about topsoil. But do you know topsoil when you see it? Can you tell it from subsoil? The opened pages along this trail—its seven reading posts—invite you to study the reality, not the translation.

Here, then, is a preview in English. The purpose of the trail itself, however, is to give every visitor an opportunity to read, for himself, Nature's story.

GONE WITH THE RAIN

Post One

There is a post with holes.

The visitor looks through hole A; sees the exposed red oak roots.

He looks through hole B; sees the gully through which the soil feeding the roots is washed away forever.

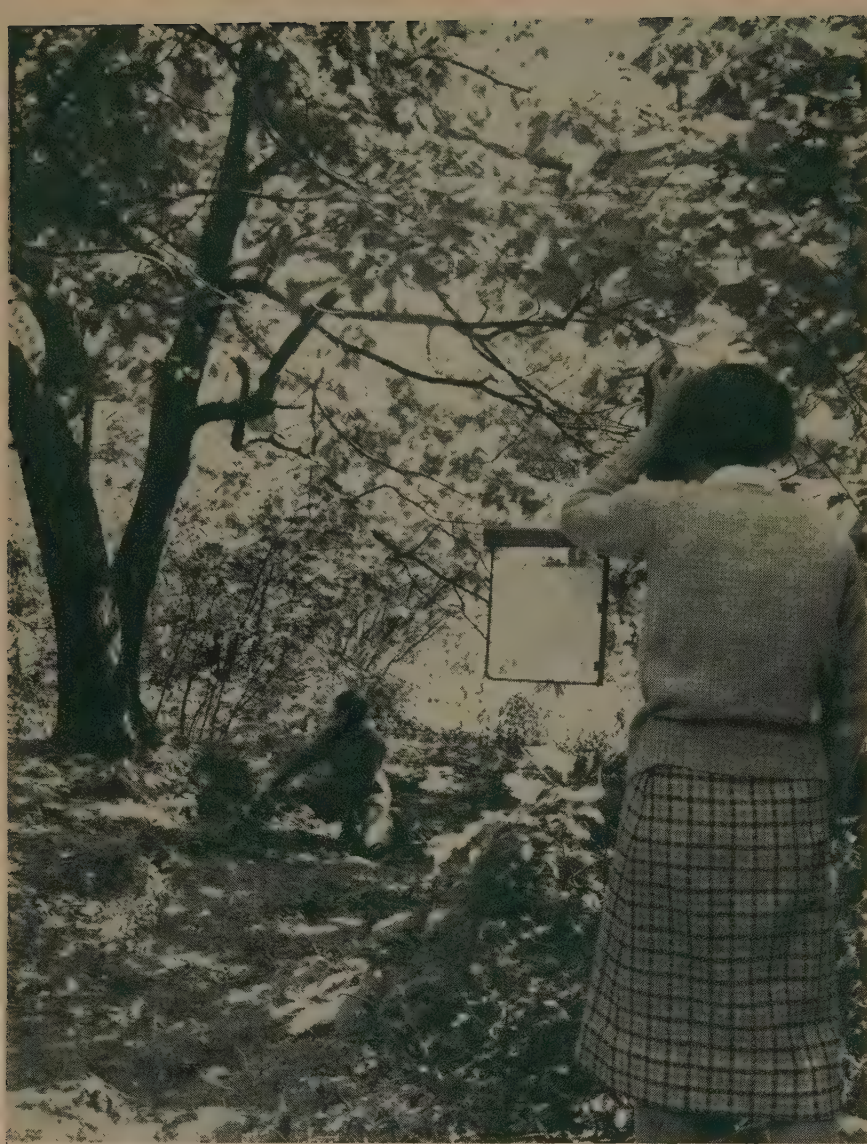
What is happening?

Here is an example of man-made erosion. Bare soil near the oak roots is ready to be splashed loose and washed away by the next rain. Twelve inches of life-giving topsoil already have been washed away in a few years; washed away because man—before this was a National Park—took poor care of the land.

What is the effect?

Nature took some 5000 years to make this 12 inches of soil. Through man's abuse it washed away in a few years. No soil means no trees, no grass, no storing of water, no permanent waterfalls for you to enjoy.

The visitor travels to the next post, about a 15-minute walk.



GULLIES are a sure sign of poorly-cared-for land. This gully, 14 feet wide and about one and one-half feet deep, extends for 100 yards before it disappears in the forest below. Notice the exposed roots of the red oak alongside it. Twelve inches of good topsoil have already been lost from this spot.

Before this park was established, the land was mostly in farms. Some crop land was ploughed up and down hill. Pastures often were grazed too heavily, killing off the grass and causing the soil to pack down. When hard rains came, they fell on bare or packed soil. They splashed particles loose, sealed up the surface pores of the soil, and carried precious topsoil downhill. On their swift path the rains cut little rills. Later the rills were deepened and widened into gullies. For many years this gully also has carried drainage water from an old road above.

Frost has helped enlarge this gully. During winter, the moisture in the bare soil freezes and expands, raising the soil into little pinnacles. When thaws come,

as on warm, bright days, the ice melts and the pinnacles are carried off by moving water.

Now a good plant cover is returning to protect the soil in the area above the gully. Gradually more water is going into the ground and less is rushing off on top. In time the sides of this gully may heal, but meantime some soil will continue to be washed away.

Subsoil from thousands of gullies has found its way into stream channels, spoiling fishing and aggravating floods. Good farmlands along the Rapidan and Rappahannock river bottoms have been covered with sand and gravel. Rushing flood waters have carried sterile material clear down to Chesapeake Bay, causing damage to the valuable oyster beds there.

It takes Nature several hundred years to build one inch of the valuable topsoil that gives us food, clothing and shelter. But when forests are overcut, or burned, or when the land is improperly cultivated or overgrazed, several inches can be quickly lost in one hard rain.



CANYON GETS NAMED

Post Two

Notice the large tree on the right.

This is a white oak. Notice the whitish-gray bark and the rounded lobes of the leaves. These trees were once abundant in the valley below, hence the name White Oak Canyon. This sturdy oak is well anchored by a taproot going several feet deep. Most of the roots, however, are near the top as seen at the last stop.

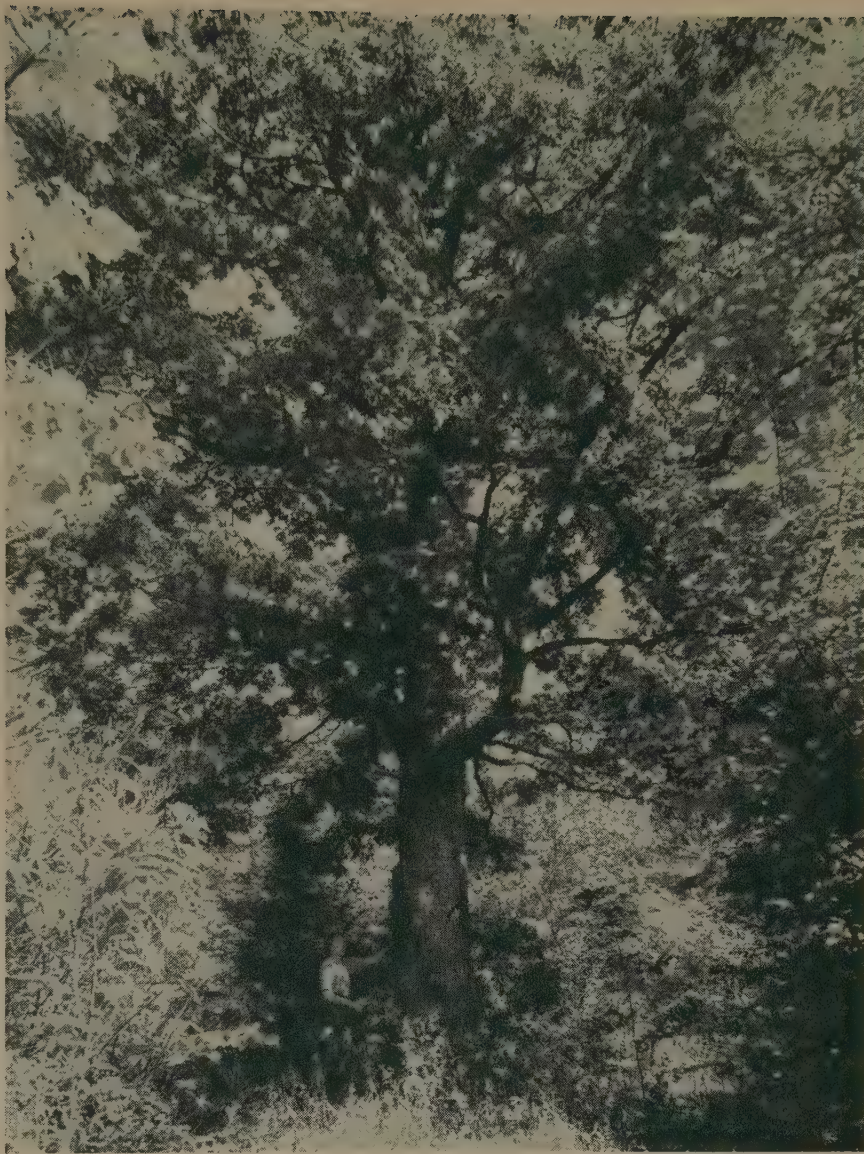
What is happening?

Plenty is happening within the trunk. Minerals and water in the life-giving soil are sucked through the roots, transformed into sap and up and up through the trunk to all the leaves. Compare with exposed red oak roots at the last stop; these can take up no minerals or water. This tree has been growing for 250 years. When this white oak was a sprouting acorn only Indians roamed these parts.

What is the effect?

Without white oaks along with other plants, no holding the soil together on the slopes; no reserve of water; no beautiful falls. (Eventually destruction of the farms below—less food or no food for you.)

The travel time to next post is about 15 minutes.



ONCE this canyon contained many large white oaks. Even larger and taller ones grew in the richer and deeper soil of the valley below. Fine farms were cleared from such land.

This tree is 250 years old. It started from a tiny acorn around the year 1700. The soil here is about 3 feet deep. Most of the roots go less than two feet down, except for the deeper taproot.

White oaks shed their round-lobed leaves each fall. During the winter no food is manufactured, but activity still goes on. Water is being taken up from the moist soil, buds are developing and sapwood is changing to strong heartwood.

Spring and summer are busy times. Tiny root hairs admit more water containing soil minerals. This flows up through roots, trunk, and branches to the leaves, which act as "food factories." By the energy of sunlight, chlorophyll (green coloring matter of the leaf) combines substances from the air with water and minerals to produce starches, sugars and proteins.

A layer of new wood is added along the entire

length of the tree, from the ends of the roots to the very tips of the outermost twigs. This growth takes place between the bark and wood inside the life-giving, paper-thin cambium layer. If this living tissue were destroyed, the tree would soon die. Fortunately, Nature has protected it with a sturdy outer bark—otherwise the tree could not survive the heat and cold of the seasons, and would quickly be killed by fires that occasionally result from matches, cigarets, or pipe embers carelessly tossed away.

White oak is a valuable plant. Its acorns furnish food for wildlife. Squirrels and chipmunks bury acorns—many trees are planted this way. Hollow trees, especially if near water, shelter families of 'possums and raccoons. Oak leaves and twigs furnish phosphorus, potash and other minerals in the soil. The roots bind the soil and help it to absorb and store more rainfall.

Alone, or in its natural forest setting, the proud white oak imparts strength and beauty to the landscape.



OLD HEMLOCKS

Post Three

Notice the large trees on the left.

Hemlock is the name for these grand old trees. In contrast to the white oak, they stay green the year round.

What is happening?

The larger ones are about 300 years old. In contrast to the white oak as at the last stop, these hemlocks feed in only a few inches of soil spreading their roots all around. As in the white oak, the sap is moving up through the trunk of the hemlock—way up to the needles. With the help of sunshine needles manufacture food, which moves down as sap along the outer edges of the trunk to be stored for future use.

What is the effect?

Hemlocks, like the white oak along with other neighboring plants, hold and improve the soil. Improved soil stores more water from rains, steadily feeds the waterfalls below.



THESE large old hemlocks started life 300 years ago, long before white settlers came into the Blue Ridge. Some grew from seeds that fell on top of an old, rotten log. Hemlock seedlings commonly start on moist litter under heavy shade. These friendly evergreens, saved from axe and plough, live on for our enjoyment. If not damaged they can exist for another hundred years. They are long-lived, by contrast with some kinds of trees, whose life span may be under 50 years.

Notice the appearance of the woods away from the road. Trees alone do not make a forest. A true forest also consists of shrubs or other small plants, the litter, the topsoil, the birds, mammals and insects.

The nature of a soil reflects the plants that grow upon it. Under a hemlock forest it differs from that under an oak forest. It is not as rich; it has fewer earthworms and bacteria; and it is more sour or acid than the soil of protected hardwood forests.

Unlike white oaks, hemlocks have no taproot. Their

roots are very shallow and spreading, seldom going 12 inches deep. They are "heavy drinkers." They prefer to keep their roots wet! This is why you usually find them along stream banks and flats where the water table is close to the surface.

Hemlocks are useful plants. Their crowns furnish good nesting places; the seeds of their small cones are relished by many mammals and birds. Their lacy, green foliage and rough brown bark lend color.

Notice the trampled condition of the ground. This was caused earlier by road travel and grazing animals and more recently by the many people who have stopped to admire the trees at close range. Such trampling injures the soil by closing its "pores," thus preventing air and water from getting to the roots. If this damage continues, the trees may sicken and die. However, by protecting the trees for a few years and by covering the packed soil with plant litter or a sawdust mulch beneficial conditions can be restored.



MYSTERY OF THE GROWING STREAM

Post Four

Notice the clear water.

In contrast to the muddy water that flows during rains in the gully of Stop One, this water is clear; it does not carry away life-giving soil.

What is happening?

Right before your eyes water is seeping into the stream—all along its length from under the mossy banks—water that has come from the slopes above—stored in soil enriched by trees and other plants, as pointed out at the last two stops.

What is the effect?

This clear flow will go to feed White Oak Falls—then down past the farms in the valley below where it helps to supply water for many useful purposes.

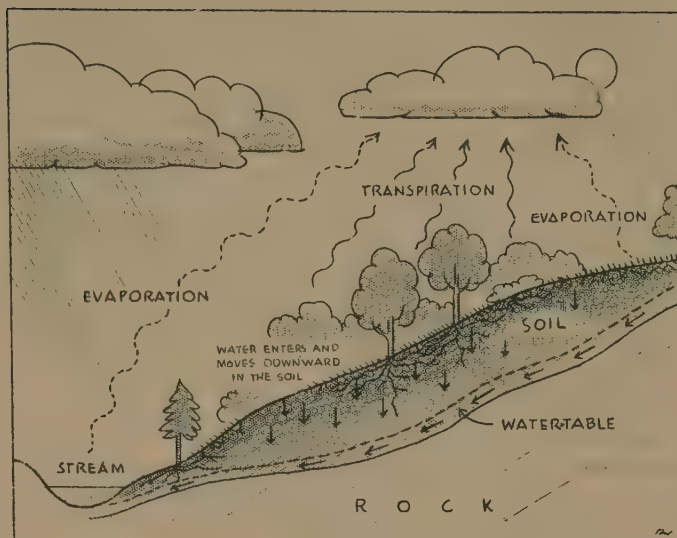
The travel time to next post is about 10 minutes. As you go, notice how the stream has grown.

HOW A STREAM GROWS

THE stream has grown noticeably larger than where you first crossed it above. It is being fed by underground water. This water represents part of the rain that fell on the land and soaked into the ground. Some was taken up by plants; some was evaporated by the sun's heat. (During the growing season much more water is used by plants than in winter.) Another portion began to move leisurely down through the soil, later coming to the surface in the stream channel. The same thing is going on all along the banks of the stream.

Wherever the soil is bare or packed down, however, rain waters rush over the land surface directly into the channels, tearing loose and carrying much soil with them. Such waters muddy up the stream and cause rapid rises. Floods often happen this way. During rainless periods the same stream may dry up, as there is no extra water within the soil to seep out and keep it flowing.

Notice the contrast between the stable banks of this stream and the crumbling sides of the gully at Stop One. Here the banks are mossed over, and firmly



PREPARED BY B.F.-USFS.

held by the roots of plants. The stream bottom is clean. Such clear, cool, shaded water is ideal for fish and the plants and insects they feed on.

SOIL STORES WATER

Post Five

Notice the various layers of soil.

The soil is dark on top, lighter below. Here before your eyes is all the soil we have; one which could be washed away in a few years by man-made erosion as shown at the first stop.

Handle the topsoil and subsoil in the box. Notice the difference in feel. Topsoil is light and crumbly and very absorbent; subsoil is heavy, tight, and slowly absorbent.

What is happening?

Plenty is happening in this soil. First when it rains, water goes gently through the absorbent topsoil until it hits the tighter subsoil below—the soil absorbs water like a blotter. Part of this water is "pumped" up by trees and other plants; another portion slowly seeps downward to feed the stream.

What is the effect?

Without the soil, we would have no water storage, no continuous clear, sparkling falls.



SOILS vary greatly over different parts of the earth. They differ as climate differs. There are forest soils, grassland soils, and desert soils. There are up-land soils and bottomland soils.

The drawing shows the layers of a hardwood forest soil. On top is the litter—recently fallen leaves and twigs and the remains of dead plants, animals and insects. The litter is extremely important. It furnishes the food necessary for the life and health of the soil. The same plants that produce it each year protect it from drying up or blowing away. Without litter the soil would become sterile, pack down, wash away.

Beneath the litter is a decaying layer—here 2 inches deep—composed of old leaves, twigs and other vegetable and animal matter. Literally billions of insects, earthworms, "thousand leggers," spiders, ants, mites, other tiny animals, and bacteria feed on this material, carry it down into and mix it with the deeper layers. Tiny plants called fungi grow in it; their feeding parts spread in all directions. These animals and plants are Nature's true soil cultivators. The greater their number and variety, the richer the soil is. They work the whole year round, even in the cold of midwinter.

The third layer, here about 3 inches deep, is a mixture of humus and mineral matter. The greater the

humus content, the darker is this layer—also the richer and healthier. Most plant roots—even of the largest trees—are found in or near this layer.

These three layers, together, make up the topsoil—here 6 inches deep. With its air, water, humus and minerals, topsoil is our most precious resource.

The fourth layer is the subsoil. This lighter-colored zone contains much less plant and animal matter—mainly the deeper roots and such creatures as earthworms, insects, and a few smaller mammals from the layers above. Root and insect and other tunnels are found as deep as 29 inches. The upper part of this layer has been leached of its minerals.

This layer is not as productive, nor can it take in water as fast as the layer above. But it, too, is useful. It provides anchorage for plants and a source of water and minerals. Under a good forest—one protected from fire, heavy cutting and especially from livestock grazing and careless logging—this layer is gradually enriched from above, becomes topsoil.

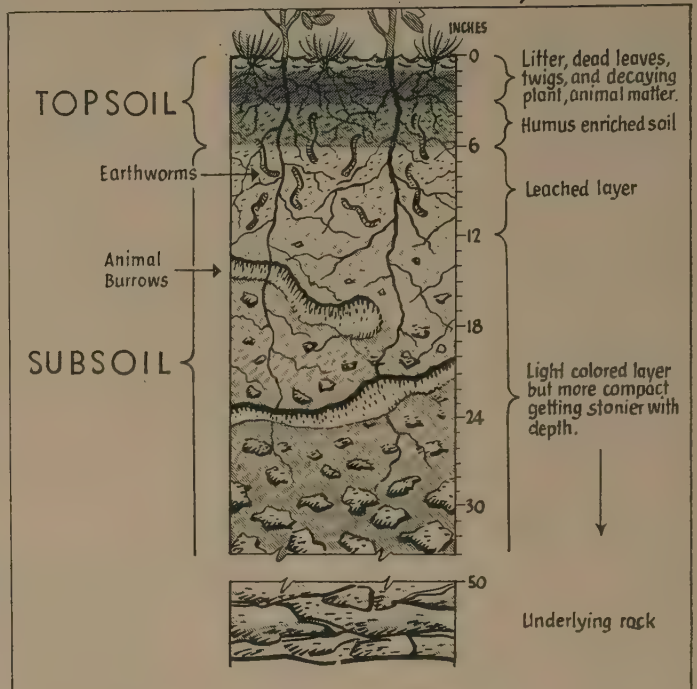
Still deeper are found few or no roots, many more pieces of stone and finally solid rock. This layer has more clay and is therefore tighter than the soil above. It takes in water slowly, and has less animal activity.

Rain water goes in gently through the litter. First to absorb it is the decaying vegetable matter. Then the topsoil begins to fill. The first six inches of topsoil under a dense, well-cared-for hardwood forest can hold well over three inches of water in its many pores and channels. Only when this layer has absorbed all the water it can hold, does the rest pass down. The subsoil takes its share but not as much, inch for inch. Any excess water moves down to the "water table." (The water table is the very wet layer found wherever water collects on top of rock or other tight material which it cannot penetrate.) The water then starts moving down hill underground, later coming to the surface either as springs or into stream channels, as shown at Stop Four.

Slowly moving underground flow maintains well-water levels, keeps springs and streams running during dry spells. It yields the clearest and purest drinking water. It helps fill storage reservoirs. It provides steady streamflow for hydro-electric power even when no rains have occurred for some time. Without such flow, White Oak Falls would often go dry.

This well-forested soil absorbs the heaviest rains that occur. It does not freeze deeply nor solidly; it takes in water from rain or melting snow even after a severe cold spell. However, the same soil cleared and planted to crops or beneath over-grazed pasture or mistreated forest would freeze deeply and solidly after a severe cold spell. In such cases, water would quickly run off over the surface and directly contribute to severe winter and spring floods.

A CUT OF THE SOIL *in White Oak Canyon*



SOIL BUILDERS AT WORK

Post Six

Notice post with holes.

- Look through hole A — Notice lichens
- Look through hole B — Notice mosses
- Look through hole C — Notice ferns
- Look through hole D — Notice shrubs and small trees

What is happening?

Tiny air-borne lichen "seeds" invade the bare rock. Lichens grow and "eat" into surface of rock. Mosses then appear and crowd out lichens. Ferns flourish on the decaying mosses helping to make soil. Finally enough soil is built to support flowering plants, small shrubs, later larger trees. All soil of this mountainside was originally created this way. Columbus had not crossed the ocean when the first lichens began to work on this rock.

What is the effect?

Without this process our world would be barren and lifeless. No steadywater falls. No soil, no plants, no food, no you!

The travel time to next post is about 25 minutes, and, as you go, you notice full-size hemlocks growing on rocks.

VARIOUS kinds of plants are growing along the sides and on top of this huge rock. They are helping to break it down into fertile soil.

Soil has formed here by the same processes which have been going on at Stop Five. First, water, heat and cold cause the rock surface to flake off into coarse particles. Acids in the water eat into the pieces, making them still finer. This process is helped by the coming of windblown "seeds" of simple plants called lichens which sprout and fasten to the rock. Several kinds of lichen grow along the side and on top of the rock. These tough plants need no soil and extremely little water. They stand great extremes of heat and cold. They release acids which dissolve the rock particles. As they grow and decay they also produce vegetable matter or humus. Rain falling on this mixture of mineral particles and humus makes it possible for other, slightly larger plants such as "reindeer moss" and other true mosses to grow on top of the lichens. These plants in turn, helped by bacteria and other tiny soil life keep adding humus and building more soil to catch and hold air and water. Then still more exacting plants—wild carrot and other herbs, and later Christ-

mas fern and bluegrass—get started from seeds carried by wind or by animals. Each group of plants improves the living conditions for the next higher group and is in turn replaced by a richer and more varied growth. Meanwhile, the number and activity of tiny soil-plants and animals are speeding up. Enough soil is built to support shrubs like ninebark, prickly ash, raspberry and others, and finally the taller and more exacting plants, like the small black birch trees. As time goes on, more soil is created from the rotting rock beneath and rich topsoil created from above, as found at Stop Five, and the number and variety of plants will increase until a complete forest soil has developed.

Here is a miniature example of how Nature makes soil and permits plants and their animal relatives to flourish. Even in this moist, cool climate, the advancement of plant life from the simplest lichens to the most highly developed forest requires a long, long time. It may have taken at least 1000 years to form the 3 inches of rich, black soil on top of this rock.

A few feet uphill you will obtain a good view of the top of the rock.



WATER THE SCULPTOR

Post Seven

Notice how falls curve around.

Observe the deep canyon at your feet.

What is happening?

The water does not flow down in a straight line—it curves around, wearing and grinding the softest rock more rapidly. Nature, as all of us, takes the easiest way. At your feet the canyon was started because of gigantic earth movements. It is being slowly cut deeper by the water. Nature has plenty of time.

What is the effect?

Waterfalls—enjoyment of the eye and ear. Compare its soothing sound with sound made, by shouting aloud the letter "E."



WHERE the slope of the land steepens, water speeds its flow. Its cutting power is greatly increased. Once the cliffs that flanked the canyon did not exist. Over the past millions of years flowing water has gradually cut through the massive rocks to create them.

The rushing waters are gradually chiselling down the stream bed. They are picking up small grains of rock and sand, using them as tools to grind and polish and to wear it down. Only when the valleys become less steep far below is the stream unable to cut so strenuously.

Gigantic earth movements, which tipped and folded the massive rocks of the earth's crust many millions of years ago, made it possible for the falls to form. Then falling water began its work. When it found a layer of softer rock on its downward course it began cutting more rapidly, making the steeper part of the falls. When the water met another hard layer beneath it cut more slowly, resuming its previous gentler grade. The winding and twisting of the stream result

from weaknesses in its rocky bed. Wherever the water finds a crack or soft layer, it gradually makes a new channel.

In time, the hard rock above the falls will be undermined and break off. The falls will move farther and farther upstream; the rapids above and below will gradually smooth out. Eventually, the stream will carve a path far below the present level. Unless new earth movements occur, the whole mountain will wear to almost a plain and instead of a steep, narrow valley the visitor of some millions of years hence will see only a placid water course wandering slowly over a wide, flat valley.

Why is the sound of the falls so soothing compared with "E"? Shouting "E" produces a pitched sound having a typically high frequency. The falls, by contrast, create an "unpitched" sound composed of a variety of frequencies. When sound "E" reaches the ear it is like being struck by a sharp object—it hurts. But the effect of the falls on the ear is like being gently patted—it is pleasing.



LET'S LOOK AT THE WHOLE PICTURE

THE trip down the canyon has revealed some of Nature's marvelous workings. The seven stops are all closely related parts of the same story. The landscape and the soils, waters, plants and animals are products of the climate and the underlying rock. Constant, natural change, however slow, is going on everywhere. No one can stop it, even if he were foolish enough to try.

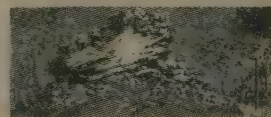
Too fast a change, however, is bad. For instance, if we recklessly destroy a forest and expose its soils, a great many things happen. Many forest birds and animals lose their homes and disappear. The soils, robbed of their protection and plant food, are unable to take in and store water normally and to regulate the flow of streams. Numerous gullies soon form on the slopes. The streams no longer flow clear the year round. During rains, muddy waters rush madly off, tearing boulders loose and ripping the banks. During dry periods flow shrinks to a trickle, or disappears altogether; no water dashes over the falls. Fish can neither spawn nor find food in that kind of a stream; the water may even be too hot for them to live in. Altogether a great many unpleasant things can happen when we are foolish enough to disregard Nature's laws.

By learning to understand and respect Nature's ways we can do much to make our stay on Earth more pleasant, and help make it a more decent place for our children and grandchildren to live in.

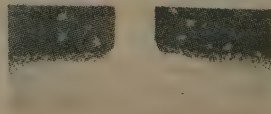
Fortunately, creation of the National Park assures protection of all natural features for the benefit of coming generations.

HOW SOIL, FORESTS, AND WATER KEEP THE FALLS FLOWING

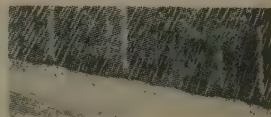
ROCKS BREAK DOWN INTO SOIL



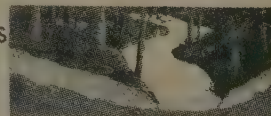
SOIL SUPPORTS FOREST



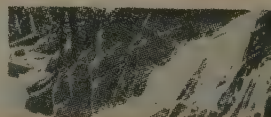
FOREST PROTECTS SOIL PERMITTING IT TO TAKE IN AND STORE WATER



WATER STORED IN SOIL SLOWLY SEEPS OUT INTO STREAM



STREAM - STEADY AND CLEAR - KEEPS FALLS FLOWING



WHITE OAK CANYON NATURE TRAIL IS THE FIRST OF ITS KIND TO BE ESTABLISHED IN THIS PARK. FOR THIS REASON WE WOULD GREATLY APPRECIATE ANY COMMENTS, SUGGESTIONS, OR QUESTIONS YOU MAY HAVE, AS VISITOR OR READER OF THIS STORY OF A TRIP ALONG THE TRAIL. SUCH WILL HELP US TO MAKE THE NATURE TRAIL MORE INTERESTING AND ENJOYABLE, OR TO HELP OTHERS TO DEVELOP A SIMILAR TRAIL.

Save Solitude!

“ONE of the most beautiful mountain lakes in existence . . . it is to me a profound satisfaction to learn that it still lies tucked away in its deep wilderness.” So wrote Francois E. Matthes, veteran of the U. S. Geological Survey, unaware that the march of “progress” was moving implacably toward the destruction of this lake, and the solitude that had moved Matthes to depart from his vow not to give names to geological features, and to name this gem Lake Solitude.



And writing, in *The Living Wilderness*, of a trip into the Cloud Peak Primitive Area of Wyoming's Big Horn National Forest, Howard Zahniser says of this “precious gem” of the Area:

“Perhaps what seemed so profound was the realization that this phenomenon which could so deeply stir, so enrich, those who looked upon it was in itself so simple, so quiet. All about the lake before one's eyes were the wild and rugged, restless Rockies, and there below was this quiet lake. For half a mile between precipitous broken cliffs in turmoil with the jumbled masses of rocky debris that were still being torn and tumbled by the elements and the relentless pull of gravity, the blue waters of the lake lay placid, stretching out quietly for a long mile. On the whole large lake was no restlessness at all. Even the reflections of the surrounding crumbling, disintegrating, deep-scarred upthrust rock were somehow quieted and seemingly made peaceful by the mirrors of these waters. In the distance the mountains rose to an aspect of majesty; near at hand they told the uneasiness that besets all earthly eminence. But the lake in their midst was all serenity. So quiet was the scene to the eye that for a time even the roar of the cataracts that plunged over the cliffs and down the bare canyons was lost to the ear, and one realized with a start that even these quiet waters themselves had not long since been rushing and roaring, twisting and tumbling, foaming their way to this serenity. . . .”

This precious gem of solitude, this beauty among mountain lakes, faces destruction. Plans of the U. S. Reclamation Bureau call for the erection of a dam, seventy feet high and 565 feet long, just below the present outlet of the lake. This would create a storage reservoir with a maximum fluctuation of fifty-seven

feet and an average annual fluctuation of more than twenty-one feet. This would flood and destroy the meadow at the upper end of the lake, where the only good camp grounds exist, and beget all of the hideousness of such water level fluctuation. This, reports The Wilderness Society, would “be destructive to the wilderness values of this most outstanding feature of the Primitive Area.”

Construction of the reservoir would provide supplemental water for 6000 now-irrigated acres in the vicinity of Hyattville, Wyoming. It would promote new irrigation on about 2800 more acres in the vicinity of the towns of Bonanza and Manderson. According to the Reclamation Bureau, this acreage “can be expected to be fairly productive after development has taken place.” The land would be used mainly to produce forage crops for livestock.

If we may judge by the reports of those who know Lake Solitude, and by the picture reproduced on this page, wilderness and recreational values of this lake and its environs far outweigh the economic need of getting water to acres that may be “fairly productive.” The mania of those who covet every bit of water they can find, so that they may exploit it, must be stayed in cases where other values are demonstrably paramount. Lake Solitude is, in our opinion, one of those places. We are happy to report that the Reclamation Bureau has halted the building of an access road into the Cloud Peak Primitive Area, and has laid the plans for the dam on the table until the issue can be given thorough public hearing. Those who feel as we do should make themselves heard, and they may do so by registering their sentiments with Kenneth Vernon, Regional Director, Bureau of Reclamation, Billings, Montana.

The Snails of Cockspur Island

By IVAN R. TOMKINS

Photographs by the Author



A dormant colony of snails makes an attractive design as they rest on a tree at the quarantine station at the mouth of Savannah River.



SNAILS and sailing-ships seem subjects far apart, yet the two can be connected, as I have found. Twenty-five years ago, when I first came to the small ballast heap surrounded by saltmarsh and water that was known as Quarantine Station, near the mouth of the Savannah River, there were land snails then in residence. The tale was that they came on some of the sailing ships of earlier days, then almost a thing of the past.

These were European edible snails, such as are farmed, marketed and eaten in the Mediterranean countries. They were evident nearly everywhere: on the walls and walks, the trunks of trees, and bending down the slender grass blades.

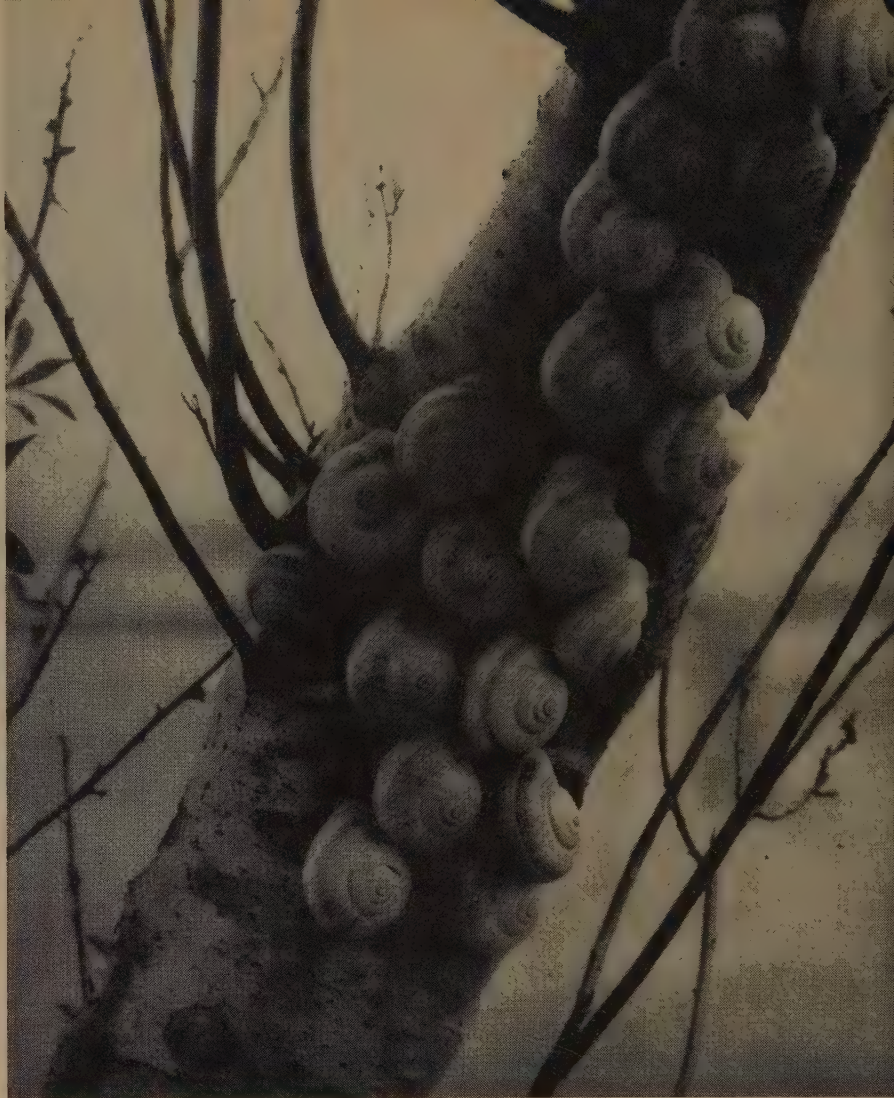
At this time, a quarter-century ago, there were two men who had known the location almost since its first use. They had known the snails for many years, and believed they had come in ballast, or that, perhaps, some epicurean mariner had let them escape.

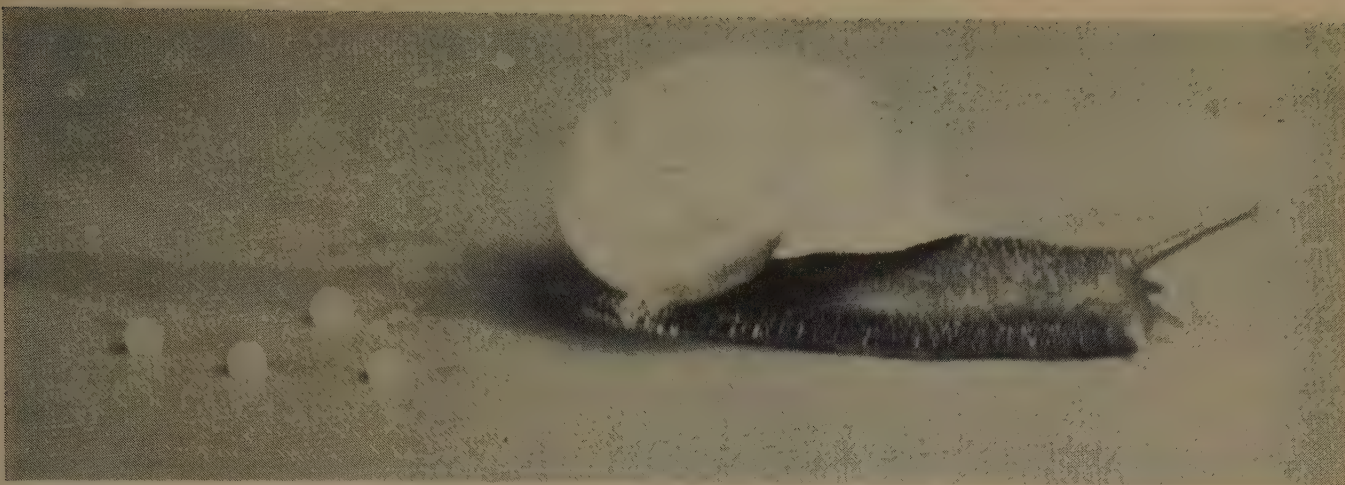
For many years this place had been the spot where ships from foreign countries were quarantined and examined for possible disease, perhaps fumigated, or allowed to go on to the city. The dreaded yellow-fever and smallpox were two of the worst diseases to be watched for. At that time, there was an old Negro there who had nursed several patients through the smallpox. He had recovered from it many years before and was immune. Knowledge about preventing diseases of this kind was not so far advanced when Quarantine was first established, and various methods

were used that now seem strange. At one time, ships in ballast unloaded all they could on shore, and the small amount needed to keep them upright in the quiet water of the river for the fourteen-mile trip up to the city was hand-dipped in bichloride of mercury solution and put back in the ship. The excess ballast rock accumulated on the shore, which was mostly marsh mud with a little sand scarcely above high tide level. Eventually the accumulation was leveled off to make a little habitable ground around the buildings, which were originally built on piles. On this ground a few native shrubs took root, then a few chinaberry trees. A few mimosa trees finally grew, and other dryland vegetation appeared. About then the snails appeared, and, like many immigrants, finding natural enemies few, prospered greatly.

Since then I have made various trips up and down the Georgia and South Carolina coast, but have found no other place where these snails are now living, even though there are equivalent ballast piles of similar origin. Probably no such chance group of snails has made its escape elsewhere, or, if so, their habitation has not yet been discovered.

Some authors say that the European edible snail,





A gravid snail, taken home, obligingly lays some eggs for the photographer, who had to take the picture of the accommodating animal indoors and under difficulties.

Helix pomata, descends to the ground in winter and burrows below the surface, then turns mouth upwards and secretes a thick, limy stopper after making a roof of dead leaves and the like. The Quarantine snails, which are of this or a closely allied species, do not seem to make such extensive preparation for wintering, perhaps because of the mildness of the climate. Their dormant season seems to be influenced by lack of moisture, and they merely stick tight to a plane surface and withdraw into their shells, whereupon a gluey door dries across the shell mouth and shuts them fast until the weather becomes warm and moist again. Warmth and humidity cause them to loosen and become active. In this hibernation time they seem to gather in communities, although lone individuals may also be found. This may be because of individual tendencies in the same limited direction, rather than any social grouping, and in a large sense all animal gregariousness may arise from the same kind of a directional drive. When grouped together, the dormant snails, with their repetitive spiral patterns, are pleasing and pictorial.

Whether the dormant season is a prerequisite of the egg-laying season, I do not know, but when, in winter, the weather turns humid and warm, they become unsealed and crawl down to the soft ground, where each lays a bunch of thirty or forty eggs. Once in December I brought a gravid snail to my room and tried to make a photograph of it by the light from the window, as it crawled across a card. It stretched out, started to crawl, then laid several eggs right before my eyes. The resulting picture was not technically good, but was of interest and value to me, far beyond a technically good but meaningless one.

When chickens were kept at the Quarantine Station, the snails diminished greatly inside the fences, although the population was always being replaced from the stock outside. In the nearby marshes there are clapper rails, whose main food is thought to be a native snail that lives in the marshes. These birds

wander out to the higher ground, and perhaps they eat some of the smaller *Helix*, yet, because they are highly limited in numbers from territory pressure, their depredations can have little meaning to the *Helix* population generally. It is not known whether



One of the snails making its way up the face of a vertical board wall.

the numerous raccoons, the cotton rats, the rice rats, or any other of the meat-eating creatures of the neighborhood feed upon them. The native land and water snails of this country often act as a secondary host to trematodes, which, at other stages, affect certain birds, or even mammals. There is no information that such a linkage exists with these alien snails that have gained a foothold.

In the years since I first saw these snails changes have taken place. Most important to the snails, spoil from dredging in the nearby river channel has been placed each side of the old ballast-heap, extending the land for miles. So the snails have slowly extended their range to the moat of old Fort Pulaski, nearly a mile away, and some distance to the west.

In depression days a CCC camp was established at Quarantine, clearing, building roads and paths to

the Fort. Then a bridge was built across the two thousand-foot stretch of water of South Channel to connect with the land network of roads. Then the war came, and the Navy took over the area and built Cockspur Base. None of these activities have had much effect on the snails. So far they have not gone across the bridge to the island stepping-stones toward the mainland. Certainly enough of them have been carried away in the pockets of small boys to start many colonies elsewhere, but I have not yet found any other place where they are living wild.

I look forward to watching them for another quarter-century, or so, with pleasant anticipation, without any worry about pecuniary gain or loss, or with any distaste for a lowly, crawling creature, which must live within its bodily limits and progress and prosper the best it can under a variety of difficulties.



Provident Trees

By MALCOLM McKENZIE

ON your first visit to a favorite woody haunt this summer, do not be unduly alarmed by the heaps of short twigs under the trusted spruce you left as winter sentinel of your favorite haven. The disordered scene sometimes arouses fears that trees have been stricken with a disease or plague, but usually the loss of the twigs on the ground causes no permanent damage to well-established trees, and no consuming malady is ordinarily involved.

The absence of lateral buds from the fallen twigs is a valuable bit of evidence to one who seeks the explanation of what he sees in Nature. During the months since your previous visit to the summer retreat, winter has blanketed the frozen ground with snow and ice, and curtailed food of the squirrels you may have fed last summer. Left to their own resources at the time least advantageous for such solitude, the animals have made the best of the situation and harvested a food supply produced by the abundance of Nature. Accordingly, spruce buds formed in summer to await expansion and growth the following year are appropriated for mid-winter use by the opportunist squirrels, who find them and cone seed-leaves of sufficient attraction as food to seek and chew the twigs involved until these woody stems break, and fall to the ground. Feeding can then be accomplished with complete concentration.

Other conifers likewise of hibernal value to squirrels are fir, pine and hemlock. Similarly, among the deciduous trees, buds of beech, birch, elm, ironwood, maple, poplar and willow may be consumed common-



ly in spring, but usually without the subsequent evidence of abundant showy debris associated with winter feeding on evergreens. A little later, during the seed-bearing season of elm, twigs from leafy growth may be detached and the seed clusters eaten on the ground. Of course, squirrels are not the only animals that borrow food stored in forest and ornamental trees. Birds, deer and porcupines are familiar examples of others that leave perhaps less spectacular evidence of their diet. During severe winters, trees may be damaged from feeding by squirrels, nursery and forest trees sometimes being injured. But, for the most part, the total damage is not serious.

An unusually large quantity of twigs about the base of your favorite spruce this summer may indicate that the first crop of twigs removed by squirrels was covered promptly with snow and ice, and intermittent storms later required successive twig pruning to maintain the food supply throughout the winter. Squirrels have been credited with planting forests, and possibly a part of the crop is only a fair remuneration.

The graceful, pendent calyces of the life plant have earned for it the specific name of *calycinium*.



These calyces are of much longer duration and more conspicuous than are the rose-colored petals themselves.

To follow the development of growing shoots, whether they spring from seed or cutting, bulb or bud, is for the Nature enthusiast always a delightful occupation. But when the new growth arises from a leaf instead of one of the more familiar bodies of propagation, the novelty and freshness of the occurrence give it a particular charm. The production of new individuals from leaves, although restricted to no single group of plants, is a somewhat rare faculty that crops up only here and there among the flowering plants and ferns. The leaves of most species, after performing their special task of manufacturing the food necessary for the growth and reproduction of the plant, wither away and die without leaving any progeny distinctly their own. But a few among the limited number of exceptions to the general fate that Nature has destined for her green leaves possess amazing vitality, and form charming subjects for observation and experiment.

Very few wild plants of eastern United States possess the faculty of reproducing from leaves. Perhaps the most familiar of these is the walking-fern, *Camp-tosorus rhizophyllus*, which is at home in deep, wooded valleys and ravines where the drying rays of summer seldom penetrate the canopy of foliage. Here the fern grows in the moist beds of mosses and liverworts that cover the tops of isolated boulders or outcropping ledges of rock. The long, slender, evergreen leaves, far simpler in outline than the fronds of most ferns, taper from a heart-shaped base to a whip-like terminal portion, and they grow in a tuft from the short rootstock. Sinking down into contact with the layer of mosses and moist humus that covers the rock,

Plants from Leaves

By ALEXANDER F. SKUTCH

Photographs by the Author

the tips of the older fronds strike root and each eventually gives rise to a new fern plant, a "step" away from the parent stock. Thus the plant "walks" from generation to generation over the mossy cliffs. In some forms of the walking-fern the auricles at the base of the frond are themselves greatly elongated; and their tips strike root in the same manner as the principal termination of the leaf, so that, to follow out the metaphor suggested by the common name, these fronds might be said to promenade simultaneously in three directions!

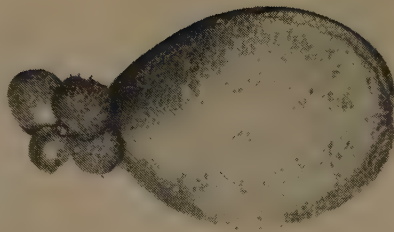
The dark forests of the Blue Mountains in Jamaica, however disappointing they may be to the lover of bright flowers, are an earthly paradise for those who find delight in ferns. The northeast trade-winds, blowing off the Caribbean, drench the upper mountain slopes with an almost daily cloud-bath; and in the deep shade and abundant moisture beneath the canopy of trees, ferns thrive wonderfully, and have almost outdone themselves in the display of diversities of size and form. Here, growing on the trunks of noble tree-ferns, which spread the intricate tracery of their enormous fronds in the woodland canopy, one finds delicate filmy-ferns and diminutive polypodies, so small that one wonders whether they can actually be full-grown ferns. Here one sees ferns with leathery, entire leaves that seem to belong to some exotic, thick-leafed tree rather than to a fern, and others with fronds of such delicacy of filigree design that they are the embodiment of our conception of what the most fern-like of ferns should be.

In all this wonderland of ferns, those which reproduce from the leaves are not lacking. There is a

spleenwort, *Asplenium radicans*, with fronds once-compound like the northern Christmas fern, the slender tips of which droop to the ground and take root, much as with the walking-fern. Because of this ready means of reproduction, this fern is very prolific, and is often found in extensive stands on the shady soil of the forest, the plants interlocked by the arched fronds, a telltale of their mode of origin. Another fern with simple, stiff fronds, *Polystichum plaschinckianum*, which I found growing in a dense thicket on a precipitous mountain-side, also produces a young plantlet at the tip of each mature frond, and is even more reminiscent of the walking-leaf. Near by on the difficult mountain-side there grew another fern, *Dryopteris effusa*, with large, much-dissected fronds, which employs a somewhat different method in the production of a new plant from the leaf. Instead of a new plantlet that springs directly from the very apex of the frond, a brown, scaly bud, about the size of a pea, is formed beneath the axis of the leaf about two inches behind its tip. Not until the frond weakens with age and sinks to the ground does this bud produce roots and leaves, and establish a new individual.

Half a world away, on the islands of Mauritius and Réunion, there grows another spleenwort, *Asplenium viviparum*, with a fecundity that has given its specific name and has been responsible for its introduction into distant lands as a greenhouse fern. The finely dissected fronds divide at the apex into several slender appendages, from each of which burgeon a number of new plantlets. Others spring forth farther back on the frond, and still more from its lateral divisions, so that a single leaf may bear a progeny of a score or more. Contact with the soil is not necessary for the initiation of the plantlets, which spring from the upper surface of the leaf while it is still held aloft.

In the great group of ferns that produce a single kind of spore—and this includes all of the familiar



A fallen leaf of *Crassula arborea*.
A new plant is growing out from
the scar of detachment.



A viviparous spleenwort from the island of
Mauritius, often grown as a conservatory
plant. About thirty plantlets of various ages
may be counted on the divisions of this frond.

thin or delicate leaf would have difficulty in surviving for such a protracted period even under the most favorable conditions. The thin-leaved ferns, which reproduce from their fronds, are not treated as cuttings; but the new plantlets arise from the leaves while they are still attached to the plant. Of course, all succulent leaves do not make successful cuttings; and the texture of a leaf does not alone determine its ability to produce new tissue, for this is a capacity that is linked with far more subtle physiological tendencies. The leaves of a number of plants become rooted when planted in the soil, but never succeed in forming a new shoot. Among the flowering plants, a few rare species produce plantlets, bulblets or tubers

kinds—*Ceratopteris thalictroides* is unique in its habit of floating unattached at the surface of quiet bodies of water. A native of the Tropics, where it is of widespread occurrence in both hemispheres, it is often grown in greenhouses because of its great botanical interest. Unlike most other ferns, it is an annual; but the limited period of life of the individual fern is amply offset by the number of well-started progeny it leaves be-

hind. The new plantlets are borne in more or less definite positions upon the upper surface of the floating leaves, and, upon the decay of the parent leaf, they become detached and float off by themselves as independent individuals.

Turning now from ferns to flowering plants, we find that there are certain groups under cultivation that gardeners habitually propagate from the leaves, so that their ability to reproduce from the foliage is well known. As a rule, propagation by leaf-cuttings is restricted to plants with thick and fleshy or else leathery, resistant leaves. With their reserve of food and water they are able to sustain life until a root system is established, even when the formation of roots is very tardy. The thick, firm leaves of the bowstring hemp, *Sansevieria*, remain in the propagating bed a full month before rooting commences. A



Sister leaves of the life plant 68 days after their removal from the stem. The leaf to the right was cut into 15 pieces and has produced the same number of healthy plantlets. The entire leaf has given rise to only a single, although much larger, shoot.



In an entire leaf of *Bryophyllum crenatum* all of the notches produce plantlets, which grow out quickly and then fall away. The plantlets on the cut leaf are growing extremely slowly. These leaves have been detached from the plant sixteen days.

on leaves that are still attached; but this form of vegetative propagation is not nearly so prevalent as among the ferns.

The begonias and gloxinias are perhaps the most familiar examples of plants that may be multiplied by leaf-cuttings. New plants are readily produced from the cut end of the leaf-stalk of begonias of various species if this is set in well-prepared soil in a pot or bed. A leaf of *Begonia heracleifolia* produced fifteen plantlets in this manner. In order to ensure the formation of a good number of plants from a single leaf, several methods are practiced by propagators. In some species of begonia, an incision is made through the principal veins, which project from the lower surface of the leaf. This is then pegged or weighted down to bring it into close contact with the soil. New plantlets may arise from each of the severed veins. Another procedure is to cut the leaf into triangular pieces, each of which contains at the apex a portion of the end of the petiole. These are stuck in the earth point downward, and the new growth springs from the buried apex of the triangle. Or the leaf is simply cut into halves along the midrib, and each half planted vertically, the cut edge downward. *Begonia phyllomaniaca* is remarkable for its propensity to form at certain seasons, often without apparent provocation, a multitude of adventitious plantlets, which sprout out from all portions of the leaf-blade,

leaf-stalk and stem. When a leaf of gloxinia has been treated as a cutting, a tuberous swelling is first formed at the severed end of the stalk, and from this the new plant eventually arises. In the bowstring hemp, a long, curving offshoot grows out from the lower end of the leaf-cutting and forms the new plant.

Among the most remarkable of plants that reproduce by means of their leaves are the "life plants". The botanical name of the genus, *Bryophyllum*, is compounded of two Greek words which we may translate "prolific leaf", and commemorates, as well as the English name, the extraordinary fecundity of the foliage. There are a number of species of bryophyllum, succulent herbs native to South Africa and Madagascar, and in other parts of the world often grown in greenhouses and conservatories. The best-known of these is *Bryophyllum calycinum*, an erect, usually unbranched plant, two or three feet tall at the time of blooming. The name *calycinum* refers to



A walking spleenwort from Jamaica. A frond of the larger plant to the left has given rise to the fern at the right. The older frond of the latter, at the extreme right, is swelling at the tip preparatory to producing a third generation.

the large, cylindrical, inflated calyces, often prettily tinted and streaked with rose, which hang bell-like from the paniced inflorescence. The calyx is prominent for many days before the four rose-colored petals push out from its cover, and remains to adorn the plant and enclose the seed-pod after the petals have withered. It is probable that the life plant was originally restricted to Madagascar and the neighboring islands, and possibly South Africa, where all of its closest relatives

grow wild, but now it is at home in practically all tropical and subtropical lands. It seems likely that it owes its wide distribution to the agency of man, who has carried it as a curiosity to all parts of the world. Thanks to its ready means of multiplication, it has prospered and grows spontaneously wherever frost is absent. Tourists to Bermuda know it well; and it is even listed among the flora of tiny Guam in the Pacific Ocean. Like most plants of succulent habit, it is a native of arid regions, and thrives best in dry, open places. In many sun-parched districts of tropical America it flourishes as a roadside weed.

The leaves of the life plant are of two kinds. When young it produces only simple leaves, but as it attains maturity it forms compound leaves with three divisions. Each simple leaf, and each leaflet of the compound leaves, have a crenate or notched margin; and it is from the depths of these notches that the new plantlets spring. While the leaf is still attached to a normal, healthy plant it never produces new growths. However, if we cut thin sections of the leaf through the notches and examine them under a microscope, we can detect a minute rudiment or germ of a new plantlet tucked away in the deepest part of each notch. To cause these rudiments to awaken and develop it is only necessary to remove the leaf from its parent plant. Having accomplished this, we have a wide choice as to the next move, for the fleshy leaf is most resistant and will remain alive in all sorts of situations, although naturally some are more favorable to the development of the plantlets than others. It will suffice simply to let it fall to the ground beneath the plant; or we may hang it in the window if the house is not too warm and dry, as it is likely to be in winter in the north—one way or the other, one is almost certain to witness something of interest.

One of the best ways to study the behavior of the leaves is to place them in a shallow tray with a piece of moistened blotting paper on the bottom. The vessel should be covered loosely with a piece of glass to prevent the too-rapid drying of the blotting paper, but it must not be sealed so tightly that air is excluded. It is best not to expose the leaves to the direct sunlight, especially if some of them have been divided into small pieces, as that causes them to dry too quickly; a north-facing window is preferable. A whole leaf, placed in a closed vessel in this fashion, will in about a week's time produce rootlets from each of

the notches; a pair at first, then a larger number. The shoots of the new plantlets appear more slowly, and it will be some days after the roots have appeared before one is likely to notice them. Although at first practically every notch shows signs of activity and a developing plantlet, after a while a few, often a single, plantlets on each leaf will forge ahead of the others, grow taller and produce a more abundant crop of rootlets. Then the roots of the less-favored plantlets will turn dark and shrivel up, and the

shoots will stop growth while hardly more than visible to the naked eye. They may remain dormant for a long period, or may gradually follow the roots in decay. Thus from each leaf, with perhaps two dozen notches, each with its potentiality of new life, one obtains only a single, or at most a very few, new plant.

Should we desire to obtain more plantlets from each leaf, to utilize all of its potentialities of producing new life, it is only necessary to cut the leaf into pieces, and thus remove the rudiment in each notch from the repressive influence of its more vigorous neighbors. Only in the case of two notches that are very close together, as at the apex of the leaf, it is best not to separate them, as the resulting pieces will be too small and will decay without producing a plantlet. The results of the experiment are most

spectacular when the pieces into which the leaf is cut are merely separated a little from each other but left in the same relative position as in the intact leaf. By proceeding in this manner one may produce, in a few weeks' time, a leaf that is bordered by about a score of thrifty green plantlets that have sprung from its marginal notches.

In the life plant, two leaves spring from opposite sides of the stem at each node. To make our experiment as convincing as possible, it is well to use such sister leaves, cutting one into pieces and preserving the other whole. One winter, from six whole leaves I obtained ten plantlets, while from the six sister leaves, divided into a total of seventy-seven pieces and placed beside the former, my crop was seventy-two plantlets. One leaf, cut into twenty-two pieces, produced seventeen plantlets; whereas the largest number obtained from a whole leaf was three. But the reader should not hastily conclude that I had outwitted Nature. On February 27, after the plantlets had been growing for ten weeks, the tallest from the leaf that had been cut into (Continued on page 164)

A Fable Retold

By CHARLES EDGAR GILLIAM

Narcissus leaned and saw
His beauty, living clear
Within the winter pool,
Outshining fear.

Ah, how men and their gods
Despise eternal truth
Revealed through prophet eyes
Of any youth!

Narcissus was pushed in
The waters deep and cool
To drown for being such
A vain young fool.

Yet beauty never dies—
Each April daffodils
Dance through old melting snows
On Attic hills!



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

The Great Comet of 1947

By ISABEL M. LEWIS

IN THE last month of 1947 there suddenly appeared, close to the setting sun, a truly great comet, the brightest to be observed since Halley's comet made its latest spectacular return to perihelion in 1910. So many people saw the new comet at the same time that no one observer could be credited with the discovery. Following the practice of naming comets alphabetically in the order of discovery in the current year, the new comet soon received the name of 1947n. It was, as its name indicated, the fourteenth, and, as it turned out, the last comet to be discovered in 1947. This sets a record, it is believed, for number of comets discovered in any one year. Some of these were periodic comets returning to perihelion in 1947, including among them Encke's famous short-period comet (1947i), which attained maximum brightness late in November, when it was just at the limit of visibility with-

out telescopic aid. Most of the comets of 1947 were visible only in the greatest telescopes.

At the Boyden Station of the Harvard College Observatory at Bloemfontein, South Africa, comet 1947n was first seen on the evening of December 8, and was described as having a bright nucleus and a tail extending to a distance of 30, or 35 degrees. To the Harvard College Observatory, which is a clearing house for astronomical news in this country, came numerous reports of observations of the comet from all over the southern hemisphere. Observatories in South Africa, South America, and Australia sent accurately determined positions. On December 12 a ship in the Pacific, northeast of New Guinea, reported that a large comet had been sighted, clearly visible to the naked eye, about 8 degrees above the horizon with a tail about 5 degrees long. It was then in the constellation of Sagittarius. Telegrams and announce-

ment cards were sent from the Harvard College Observatory to observatories, and to individuals who have arranged for this service, giving latest and most accurate positions of the comet, as is customary when any new object is discovered.

Three observations are all that are required to obtain an approximate orbit for the newly discovered object. It is assumed, at first, that it is moving in a parabolic orbit and making but one visit to the sun. Not until the object has been observed over an arc of its orbit of considerable length is it possible to determine whether it is moving in a parabolic orbit or an elongated ellipse. In the latter case the comet will return again to the sun, although the elliptical orbit may be so elongated that its period may be thousands of years long.

Within a few days of its discovery a number of independently computed orbits of the comet were available, and the results of the calculations were published on Harvard Announcement Cards. These were in good agreement and showed that the comet had passed perihelion on December 2, before it had been observed, and its approximate distance from the sun on that date was about ten million miles. Its motion was retrograde so it was moving in a west to east direction, which is contrary to the usual direction of motion of the members of the solar system. Comets, however, do not conform to the habits of the better regulated members of the sun's family, and, as often as not, move contrary to the usual direction of orbital motion. The orbit may be both greatly elongated and inclined at an angle of more than 90 degrees to the ecliptic, in which case the motion is retrograde.

It is at this time too early to say whether the great Comet of 1947 will return to the sun eventually, or is now headed toward interstellar space. The comet will be followed by large telescopes long after it has disappeared from view in small telescopes. Between December 15 and 20 observations were obtained at the Lowell Observatory at Flagstaff, Arizona, and the McDonald Observatory, a branch of the Yerkes Observatory on Mount Locke, in Texas. By this time the comet had lost much of its early splendor. So far south was it, in the days immediately following its discovery, that observers in the mid-latitudes of this hemisphere awaited in vain for a glimpse of it in the southwest following sunset. When it did finally appear above the southwestern horizon it had already faded to 4th magnitude, and before the end of the year was visible only telescopically. This does not mean, however, that much information may not be obtained from spectroscopic observation of the changes that may take place in the body and its physical composi-

tion. Spectrograms taken at McDonald already show bands due to the presence of ammonia. Early observations showed a split in the bright nucleus of the body, as if it were splitting into two parts physically, or the head was composed of more than one mass. The early observations were confirmed by later observations made in this country, and at observatories in the southern hemisphere as well. So rapidly has the comet been moving since it first appeared spectacularly in the immediate vicinity of the sun, that by January 15 it was passing from Capricornus into Aquarius and was more than 130 million miles from the earth. Before long, it may be expected, there

will be published better determined orbits of the comet, and an ephemeris, or day by day positions, of the object in the heavens for the benefit of those who wish to follow its path through the heavens as it moves away from the sun and the earth. For a great comet the splendor of 1947n has been of extremely short duration, and its unfavorable position with respect to northern observers

when it was at its best has been exceptionally disappointing to them.

Another comet of 1947, known as Bester IV, since it is the fourth comet to be discovered recently by this observer, or also as Comet 1947k, promises to be visible to the naked eye in this hemisphere, when it comes to perihelion on February 16, and to remain visible possibly well into April before it again becomes a telescopic object. It is difficult to predict so far in advance, with any certainty, how bright a comet will be, since these objects at times change suddenly and unaccountably in brightness. This change may arise from an encounter with some resisting medium in space, it has been suggested, or to some physical change taking place in the comet itself.

Comet Bester IV, at the time of discovery late in September, was of about the 11th magnitude, and was in Eridanus to the southwest of Orion and moving southward. For some time it has been visible only in the southern hemisphere, but when last seen in northern latitudes, early in November, it was of about the 9th magnitude and had a broad tail a quarter of a degree in length. At the time of its perihelion passage on February 16 it will be lost to view in the rays of the sun, but will appear shortly after in the morning sky in Capricornus, and may at that time be as bright as a star of the second magnitude. During March it should remain visible to the naked eye and will pass during the month from Capricornus through Aquila into Cygnus. It will continue to move in a northwesterly course during the spring, and by May 1 will be above the bowl of the Big Dipper in circumpolar regions, having passed (Continued on page 157)

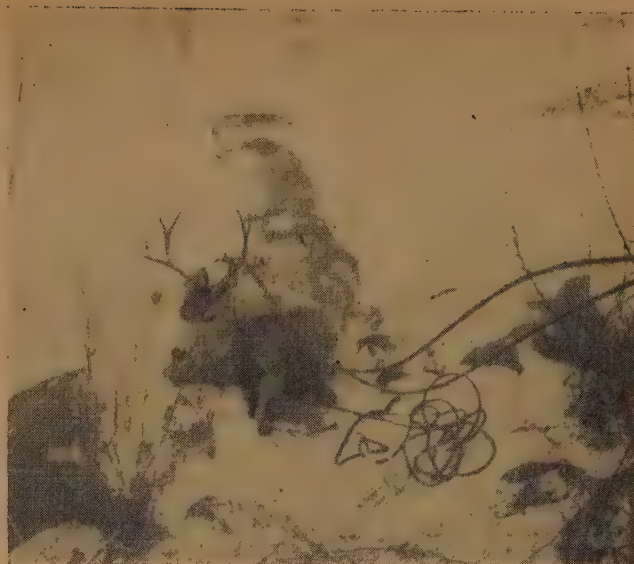
Exhibit

By ELSIE LEIDHEISER GIBBS

Last night a rare collection
Of jewels was on display;
And when the evening ended
Each star-gem was put away,
Wrapped in cloud-cotton, and laid
On the blue shelves of today.



A four-point buck tries to make a crossing of the Colorado River in slush ice near Glenwood Springs, making a pathway through the fluid medium until it reached solid ice, which closed in behind the



animal and trapped him. The deer's rescuers cut a pathway to the trapped buck, roped him in order to help him out of his near-fatal predicament, and pulled him ashore. He took off for the woods.



Deer Doings

DEER stirred things up considerably in Glenwood Springs, Colorado, in early December, 1947, reports Allyn Cole, lawyer of that community, sending the pictures here. These were taken by Roy Claycomb, local sheriff, who, with Highway Patrolman Yarberry, went to the rescue of the stricken animals in two cases. Shortly after the deer was pulled from the Colorado River, word came that two bucks were down with locked horns on Crystal River. When the officers arrived they found one deer had already died, and that the other was doomed unless it could be released. The officers sawed off a horn of the dead deer, releasing the other buck, which, as is seen in the picture at the right, limped away to safety, perhaps much wiser than before.



Camera Trails

By EDNA HOFFMAN EVANS

THIS month "Camera Trails" is going backwards on a historical jaunt to see just when, where and how present-day photography got started. I hope the tour will be an interesting one and, when it is completed, I suspect that modern shutterbugs will be mighty glad they do not have all the work and worry known to photographers who lived a generation or so ago.

Today it is a comparatively simple matter to load one's camera, snap a series of pictures, and then take them to a developer to be finished. Even a home darkroom, be it ever so elaborate, is push-button simple compared to the white-of-egg treatments and portable photography tents that were picture-taking necessities not so many decades past.

Cameras, too, have come a long way since the original "camera obscura" that is the ancestor of all modern ones. This granddaddy of all cameras is of rather ancient origin, although no definite date can be assigned to it. Euclid knew some of the principles involved as early as the year 300 B.C., while Alhazen, an eleventh century astronomer, also made use of it in his work. Roger Bacon and John Pechan Vitellio toyed with its principles in the thirteen-hundreds.

The camera obscura, old as it may be, looked remarkably like a modern box camera. It was merely a light-tight box, or perhaps even a light-tight room or tent, with a small hole in one side. In the earliest type of camera obscura, a pin hole was used and the images of external objects were cast on the wall or screen opposite the hole. Later a lens was fitted into the opening and the image was formed on a sheet of ground glass or translucent paper on the other side.

Thus far, photography was simple. The big problem was how to retain the image permanently, after it had passed through the lens. To solve this problem, photography plunged deep into the realms of chemistry and physics. Great names are connected with its development—Sir Isaac Newton, Sir Humphry Davy, Josiah Wedgwood of pottery fame, Sir John Herschel and many others.

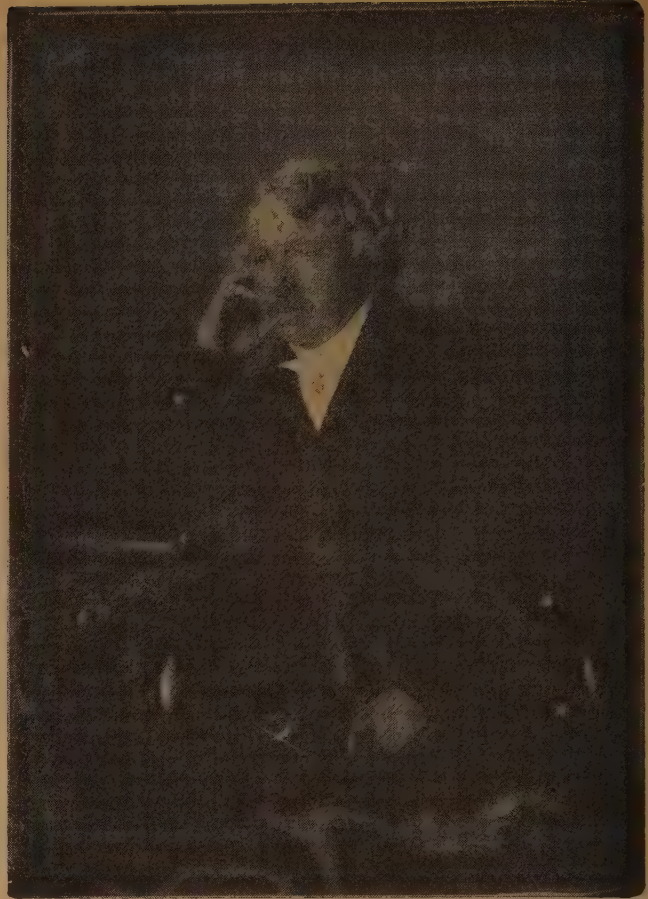
As is usually the case, many of the discoveries were made by accident. One new find paved the way for others, until the entire structure of modern photography was built.

Alchemists of the middle ages knew that silver compounds were sensitive to light, but the first clear record of anyone noticing how silver nitrate blackens when exposed to sunlight was made in 1727 by a German physician named Schultze. Fifty years later a Swedish chemist named Scheele projected the solar spectrum on paper that previously had been dusted with fused silver chloride, and found that the part exposed to the violet end of the spectrum darkened most rapidly.

Thomas Wedgwood, son of the famous British pottery maker, became interested in photography, and also became what might be called the first Nature photographer because he tried to make photographs from Nature in a camera obscura. Wedgwood worked with Sir Humphry Davy, the chemist, and while his attempts along the Nature picture line were not successful, he was able to produce white silhouettes of leaves, insect wings and the like on paper coated with silver chloride.

The next great problem was how to fix these prints so they would not be destroyed when exposed to light. This remained unsolved until 1839 when Sir John Herschel pointed out that the sodium thiosulfate he had discovered in 1819 could dissolve away the unaltered chloride of silver and thus permit the fixing of pictures. Sodium thiosulfate is the old standby that present-day photographers call hypo.

While Wedgwood and Davy are the ones who worked out the basis for modern photographic processes, the business of



The gentleman looks pensive and the print is battered, but they share the distinction of being "firsts". This is the original Daguerreotype of Daguerre, presented to the Smithsonian Institution by G. Kramer of St. Louis, Missouri.

picture taking made a detour after their time, and two other men are better known as photographic fathers—Niepce and Daguerre.

There would not be so many snapshotters today if everyone had to spend the time and effort required by picture taking in the days of Niepce and Daguerre. Both were Frenchmen, the former being a lithographer and the latter a painter. Both were interested in recording images made by the camera obscura. Niepce made the first permanent photograph (he called it a heliograph) of a drawing in 1824, and his method was complicated, to say the least.

First he coated a silver-faced copper plate with asphalt dissolved in oil of lavender. When dry, this plate was exposed to light in the camera obscura for about twelve hours, and was then washed over with a combination made of one part oil of lavender and ten parts petroleum. Next, the picture was washed in water and dried, then the plate was placed in an iodine fuming box until the light silver ground turned dark. After the remaining asphalt was removed, the lights and shadows appeared in their proper relations. The plate also could be etched, inked and then printed as an ordinary etching. By such a means was the first permanent photograph obtained.

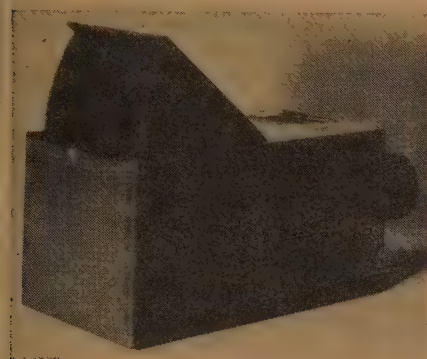
Daguerre continued the research after his partner's death, and, by 1839, was using copper plates, one surface of which was silvered and highly polished. These plates were fumed with iodine and then exposed in the camera obscura for about fifteen minutes before being ready for development with vapor of mercury and fixed in a solution of hyposulphite of soda.

Pictures made by the Daguerreotype process were pronounced extremely satisfactory from a technical point of view. The pictures were of good quality and the general public, who always like to have pictures of themselves and their loved ones,



This is the Morse Daguerreotype camera. It is thought to be the first of its kind made in the United States. It was used by Prof. Samuel F. B. Morse, inventor of the telegraph, and is now a part of the Smithsonian photographic collection.

It became definitely Daguerreotype-conscious. After all, that was the first time they could actually see themselves as others saw them—and by mechanical means. Before that, who could be sure that a portrait painter or a miniature artist was actually getting a real likeness? A Daguerreotype camera, on the other hand, was sure to do the trick.



The camera obscura is the granddaddy of modern cameras. This portable model, now on display in the photographic collection at the Smithsonian Institution, was made by Osada of Tokyo in the School of Arts, Manufacture of Tokyo. No dates are available for it.

Thus, for the next fifteen years, Daguerreotype was all the rage, and was used by photographers throughout the world.

The first actual human portrait made by the Daguerreotype method is credited to Dr. John W. Draper, a professor at New York University, in 1840. His sister, who was the subject, obligingly covered her face with white powder to intensify the action of the light and posed in direct sunshine for a time variously reported at from five to thirty minutes. Later the Daguerreotype posing time was cut to about ninety seconds, and the special face powder was dispensed with.

What is thought to be the first American Daguerreotype camera was made in 1839, and was used by Prof. Samuel F. B. Morse, inventor of the telegraph. This camera, together with many other devices marking steps in the development of photography, may be seen in the special photographic display in the Smithsonian Institution in Washington.

There, on the balcony of that great red brick storehouse of learning, one may obtain a telescopic view of the whole course of photography, from the big, black, king-sized camera obscura that is dateless, to the latest movie, aerial, X-ray and other special cameras. The Smithsonian photographic display is well worth a visit from all camera fans.

With Daguerre and his process, photography reached one pinnacle of development. That was less than a century and a decade ago. Photographers were still experimenting and photography still belonged to the realm of the laboratory and the researcher. People had Daguerreotypes made, but they snapped no pictures themselves. What few Nature photographers there were had to be content with making silhouettes of leaves and the like. Photography had been born and reared to a healthy infancy, but it still had a long way to grow. We will consider more of that growth next month.

TRADE DATA

As for trade data, here is a quick run-through of the most likely-looking items. E. Leitz, Inc., has issued a 53-page instruction booklet for the Leica IIIc camera, which tells just about all that can be told concerning that fine miniature and its accessories. Priced at 35 cents, it goes free to registered owners of Leica IIIc's. . . . Argus has issued a new 35mm camera, the Minca 28, in the under-ten-dollar price range. Naturally, this model cannot do what the better Argus-family cameras can. . . . If you want to add another camera and supplies catalog to your collection, write for the 1948 Buyers Guide issued by the Concord Camera Corp., 901 West Jackson Boulevard, Chicago, or 265 Peachtree Street, Atlanta, Ga. . . . Weimet Film Company, Inc., has added 8 and 16mm panchromatic "Green Seal" movie film to its line, which previously included panchromatic roll film in popular sizes.

PET PEEVE

I wonder how much longer film packs are going to be scarce. The last two packs I was able to get were Christmas presents—one obtained by accident and the other by practically twisting a dealer's arm. Why the scarcity? Film pack users—let us unite and holler for relief!

Televising Wildlifers

An elaborate television broadcast is being arranged as the main feature of the annual banquet of the Thirteenth North American Wildlife Conference to be held at the Hotel Jefferson, St. Louis, March 8, 9, and 10. Station KSD-TV will move its technical facilities into the grand ballroom of the hotel so that those present may see both the making of such a broadcast and the finished product.

THE GREAT COMET OF 1947

(Continued from page 154)

during April from Cygnus through Lyra into Draco and Ursa Minor. It will gradually decrease in brightness during March, and may become visible only telescopically early in April.

Mercury will be a morning star throughout March, and will be at greatest western elongation on March 17. This is a very unfavorable elongation, however, for the planet will be less than ten degrees above the horizon at sunrise. Venus is now a magnificent object in the evening sky, setting about four hours after the sun in the middle of March. It is steadily increasing in brightness and drawing farther away from the sun. The planet Mars is now well up in the eastern sky at sunset a few degrees northwest of Regulus. It is now decreasing in brightness, and by the end of March will be less brilliant than Regulus. Jupiter now rises shortly before midnight in Sagittarius, and will be seen low in the southern sky for the remainder of the month. Saturn is in Leo, a few degrees northwest of Regulus and a little southwest of Mars, and is fully a degree fainter than Mars. It has been moving westward among the stars, or retrograding, since the beginning of the year.

Spring will commence in the northern hemisphere on March 20, at 11:57 A.M., Eastern Standard Time, when the sun crosses the equator coming north. The sun is then in the constellation of Pisces, but the sign of Aries.

Sierra Club Handbook

The Sierra Club: A Handbook. Edited by David Brower, in cooperation with an editorial committee of Ansel Adams, William E. Colby, Charlotte E. Mauk, Harriet T. Parsons and Blanche Stallings. San Francisco, 1947. The Sierra Club. 115 pages. Illustrated.

This is a sort of guide to the Sierra Club, its activities, its importance as a conservation force, its achievements and program. Founded in 1892, this Club has a notable history, one that is well worthy of recording in type both for the members of today and tomorrow.

ANSWERS TO BIRD QUIZ

1. C—Booby; 2. C—Secretary Bird; 3. A—Great Auk; 4. A—Oroles; 5. C—Ostrich; 6. B—Quetzal; 7. B—Adjutant; 8. A—Geese; 9. D—Bower Bird; 10. B—Shrikes; 11. A—Ptarmigan; 12. B—Pigeons; 13. 3—Hummingbirds; 14. D—Mallard; 15. C—Loon; 16. A—Kiwi; 17. D—Eider; 18. B—Lyre Bird; 19. C—Passenger Pigeons; 20. B—Owl; 21. D—Mockingbird; 22. A—Turkey.

The School Page

By E. LAURENCE PALMER

Professor of Nature and Science Education, Cornell University, and Director of Nature Education, The American Nature Association

WE'LL BE SEEING YOU

It has been fun writing these pages, telling you of things we have read about, commenting on ideas advanced by others, and reading your reactions to this and that proposal. But the time has come when it behooves some of us to go about a bit to see just how things really are in this game of teaching Conservation, Nature, and Science.

By the time this appears in print, a number of my graduate students and I will have taken to the road to see what we can see. We hope that, by the end of the summer, one of us, at least, will have visited your state. We have been corresponding with the presidents of colleges and training schools, with state leaders and local superintendents, with writers of texts and of school outlines, with national leaders in science and in education, to get some line on where we can see the best teaching in the fields of Nature education, Science education and Conservation education. We hope that our correspondence has called your work to our attention, if you think you are doing a good job, because if that is the case, then "we'll be seeing you." It may be that you will be attending a workshop this summer, or visiting a national park, or cooperating in the maintaining of a wildlife sanctuary. If so, you may find one of us dropping in on you some day to discover what is best in this field. The result of what we find will, of course, be reported, in part, on these pages of forthcoming *Nature Magazines*, and elsewhere.

Twice before, The American Nature Association has gone all out on such a survey. Each time in the past, we published an edition of *The Nature Almanac* as a result. It is doubtful if such a publication will be forthcoming this time, but we are sure that what we find will be presented in a form in which you can use it when the studies are completed by a year from this June. We know that the studies will enrich some of the offerings of the pages of this magazine. We feel that, in spite of certain conservatism we have met so far, that we may pass some worthwhile judgments on the improvement of teaching about our fields over the radio, and we are confident that our studies will be well integrated with studies made by other groups that are prepared to exert an international influence. This means, of course, that if you are doing some work that you think is outstanding, and you want us to know about, or that you feel we can help you on, you should let us hear from you immediately.

One group of us will be working during the spring months, and will have been on the road a few weeks when you read these words. Another group, of which I will be a part, will be

starting by the first of March for the West Coast. We hope to be somewhere on the West Coast during most of April, and will be coming back through the northern part of the United States in May. Five of us will be traveling during this period in various parts of the country. With the advent of summer work, four others will take to the highways to visit parks, sanctuaries, special workshops, radio stations, and other centers of influence. During this time, the spring group will be working up their findings and checking on their results, in part through the cooperation of the summer group. In the fall months, we hope that the studies will be finally rounded off, unless it seems necessary to make further investigations during the winter. In this case, investigators will be available to do the work that is necessary.

The group that will be carrying on these studies represents a wide range of training, experience and geographic background. There will be experienced elementary teachers, secondary school teachers, teachers' college and liberal arts college teachers. There will be engineers, chemists, meteorologists and professional educators. Men and women will take part in the study. They will come from New England to California and

from the North and the South. Each will have his particular interest to develop, but each will be alert to material that may be useful to the others. We doubt if a similar study has ever before been made by so small a group, representing such diverse talent, and at the same time so closely integrated for the good of the whole.

During the last few years, preliminary studies have been made by students similarly inclined, but the opportunity for a comprehensive survey in more or less normal times has not previously presented itself. One of the recent studies by Dr. David B. Turner of British Columbia represented personal visits and evaluations of the programs designed to train professional workers in wildlife fields. This study was sponsored jointly by the Graduate School of Cornell University, The American Nature Association and the Wildlife Management Institute. A report of this study should be off the press soon. The present studies are sponsored by the first two of the above mentioned organizations with some

assistance from other organizations as well, but to a lesser degree.

In making this survey, we are being insistent that we see first hand what is going on throughout the country. We are not interested in overpublicized activities or in too much mass education as much as in what is going on day after day that is of a constructive nature in this field. We have every reason to believe that some of our most helpful suggestions will come from what we may see some teacher doing with a dozen youngsters in some place that was never mentioned before in a yearbook or a major professional journal. We are confident that some plot of land of an acre or more may be the center of some real conservation work that is more significant than what may be taking place on some great park. These are the things we want to know about, and to which we hope you will call our attention. And remember, we are just as much interested in what goes into the training of a teacher at the college level as we are in what that teacher may be doing with youngsters at the pre-college level. We also feel that we should

Trees on Fire

By WADE VAN DORE

When fire is out of bounds, the deer, the moose,
The bear, and every animal and bird
Try wildly to escape, a-foot, a-wing.
The trees stand still, and what they need is rain
As they have never need it before,
Not for their roots but for their burning leaves
More bright than autumn frost could ever make them.
I saw a fire, once, in the trees this way.
A wind unto itself, it writhed and curled.
Along the ground and through the air it came.
The sky had sparks the caught trees wildly threw
Like burning seeds to heaven, a seed of flame
For every seed that died below in earth.
Behind the barrier of a lake that hissed
When trees arrayed with death were thrown to it,
I watched and heard the great fire being fed.
Alone in that abnormal wilderness
I felt the tremor of the forest's wound.

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find some worthwhile offerings in such institutions as junior colleges that offer, in some cases, terminal education for individuals who are not likely to enter professional fields. Whatever your interest may be, then, you can rest assured that we have some one of our group whose major interest is your work. We hope that the whole project be mutually helpful.

A letter or telegram sent to E. Laurence Palmer, Fernow Hall, Cornell University, Ithaca, New York, will put you in touch with this active project. It may be that one of our workers will be driving through your part of the state this next week. We will know where each worker is each week, and will gladly modify our itinerary to meet your needs if this is possible within the limits of existing commitments. If between now and next September, then, you expect to have any activity that you feel should be represented in this survey, we trust that you will call it to our attention. Ideally, we should like to drop in on you some afternoon and be able to report that what you are doing is so good that others should know about it, but I am afraid we do not have sufficient clairvoyance to discover, unassisted, every place where good work is being done. You may not yourself feel that you are doing outstanding work, but you may know of someone else whose work is so exceptional that it should be called to our attention. Will you not help us, your acquaintances and others, by informing us?

Recently, on a field trip outside of Chicago, one reader of this page commented that she had travelled 500 miles to go on a field trip that would present the philosophy advocated by this page. We may be able to save you such a trip because our group expects to travel between 60,000 and 70,000 miles in the next few months to the end that our philosophy may be more closely integrated with the situations that really exist in the community where you live. Who knows? Maybe we really will be seeing you soon. If the move is yours, do not delay until we have moved on beyond your region.

Nature Camp

On June 11 the Audubon Nature Camp, on a 330-acre, spruce-covered island at the head of beautiful Muscongus Bay, sixty miles northeast of Portland, Maine, will open its tenth season. Five two-week sessions will offer field courses at cost. The island offers a wide variety of opportunity for study, and campers will meet Nature outdoors in the company of a distinguished staff. Also three two-week conservation workshop sessions will be offered at the Audubon Nature Center at Greenwich, Connecticut, one hour from New York City. Full details about both may be obtained from Field Sessions Department, National Audubon Society, 1000 Fifth Avenue, New York 28, New York.



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AMERICAN NATURE STUDY SOCIETY

By CHARLES E. MOHR

SANDWICHED between record storms, which marooned or delayed members and scheduled speakers in the East, and which harried many persons returning from Chicago, the annual meetings of the American Nature Study Society and the National Association of Biology Teachers were held in conjunction with the 114th meeting of the American Association for the Advancement of Science.

A popular innovation during the Christmas week program was an all-day field trip to the Indiana Dunes State Park, on Sunday, December 28, reported more fully here by Dr. E. Laurence Palmer.

At the annual banquet of the American Nature Study Society at the Hotel Sherman, the re-election of Mr. Teale as president was announced. Dr. Eva Gordon, Cornell University, was elected vice-president. Dr. Richard L. Weaver continues as secretary-treasurer.

One of the joint sessions of the two societies took the form of a panel discussion on "What is Resource-Use Education and How Does It Fit into Our School Program?" Dr. Weaver was chairman of the panel which included Dr. Paul B. Sears, Samuel Ordway, John E. Ivey, Jr., George O. Hendrickson, and R. H. Eckelberry.

"Resource-Use" Education is a term widely used in the Southern States in preference to Conservation, according to Mr. Ivey, who declared that it was the duty of the schools to teach people to adjust themselves to their environment—biological, physical, and social—and to teach them how to use all their resources wisely.

"Schools must become forces for improving living conditions," Ivey insisted, pointing to the record in the South where educators, scientists, and business men are working together toward this goal. There are 36 regional agencies and more than 600 local organizations working out resource-use programs adapted to their own environments. The Regional Committee's staff offers year-round help, and organizes semi-annual conferences where progress reports provide opportunities for stimulation and guidance.

Conservation or Resource-Use Education should not be taught as a separate subject, the panel agreed unanimously. Instead, it should enter the curriculum in many places, particularly in science and social science classes.

Evaluating, blending, and using the varied offerings of federal, state, and private conservation agencies require the continued efforts of teachers and curriculum experts, the panel agreed. Chicago's new courses of study in science were cited as a splendid example of the accomplishment of such a committee. The curricu-

lum work has been supervised by Dr. Verne O. Graham.

After the symposium, Roberts Mann, Superintendent of Conservation of the Forest Preserve District of Cook County, Illinois, presented an "Uncle Ezra" broadcast, a sample of the Nature programs that are heard weekly by more than 200,000 children.

A feature of the Society's opening session was a report by Mrs. May T. Watts on the adult education program at the Morton Arboretum at Lisle, Illinois. Nature crafts, new types of labels for Nature trails, and attractive, informative mimeographed and printed leaflets and bulletins were exhibited.

"Training for Naturalist Work and the Nature Programs in the National Park Service" was outlined by John Doerr, recently appointed Chief Naturalist. Dr. Bertha M. Parker, University of Chicago Laboratory Schools, described the use of the Basic Science Education books in the classroom.

The development of Nature education in California was reviewed at length by Dr. Leo F. Hardsall of Fresno State Teachers College. Remarkable lapse-time colored, sound motion pictures of the germination and blossoming of flowers were presented by John N. Ott, Jr. The film had for its climax a spectacular sequence in which the repeated, controlled wilting and recovery of flowers was synchronized with "The Dance of the Flowers".

Richard W. Westwood, vice-president of the ANSS, president of the American Nature Association and editor of *Nature Magazine*, opened the sessions with some timely advice to the growing army of Nature writers. Cautioning prospective writers to avoid unnatural, fancy style, and above all, anthropomorphism, Mr. Westwood urged more members of his audience to try their hands at writing.

"You folks have interesting information to impart. You have a responsibility to write; to influence; to reach out beyond the limits of your specialty. Don't be satisfied with telling your story just within the Nature study or conservation family. Let's educate the editors of publications of large and general circulation to the end that the message we have to carry will get widespread delivery and acceptance."

The next meeting of the ANSS and the NABT will be held in Washington, D. C., next December, rather than in September, when the AAAS meets.

NATIONAL ASSOCIATION OF BIOLOGY TEACHERS

By E. LAURENCE PALMER

FOR the most part, the Christmas meetings of the National Association of Biology Teachers were limited by the capacity of the rooms in which they were held. Naturally, this did not apply to the

field trip held at the Indiana Dunes State Park, but even there more than eighty took the hike of eight or nine miles to the "Big Blow-out" and back. While Edwin Way Teale, president of the American Nature Study Society, led off at a breath-taking pace because he knew what distance lay ahead, the writer, as president of the National Association of Biology Teachers, took a more leisurely speed in the rear. We managed to squeeze into the house at the end where Roberts Mann had seen to it that we were amply and appropriately fed and warmed.

I cannot report on Ed's "Tealeology" because I was too far in the rear, but, from reports that drifted back, everyone in the forward section was pleased with the interpretations the "Dune Boy" was able to make of his old stamping ground. In this, he was ably helped by Dr. Verne O. Graham and other local leaders whose experience gave them an inside track on matters of local interest. While the "rear-guard" had time to find many interesting plants and the tracks of red squirrel, flying squirrel, gray squirrel, deer mouse, meadow mouse, shrew, red fox, dog and cat, and skunk sign on the way out, possibly the most profitable period was the last half hour before the train came in when we found what the crowd had missed on its initial hundred yard dash.

The leaders had expected a possible score of persons on the trip and were surprised, but not completely daunted, by developments. The dunes were up to expectation and the weather far exceeded anything we had a right to expect at that time of the year. It is quite possible that similar joint trips may become traditional in subsequent meetings of the societies.

The regular meetings of N.A.B.T. held in Chicago were possibly highlighted by Dr. William P. Allyn's offerings on the mammal's "mind", by Dr. Dean Smiley's paper on the contribution of medicine to human health, and by Dr. Oscar Riddle's analysis of genetics and human behavior. The program, planned by the Association's president-elect, Howard Michaud, reemphasized in paper after paper the importance of recognizing individual differences and of integrating the offerings of all sciences when attempting to understand the nature of any one organism. It was pointed out that just as there is no such animal as "the frog" or "the fish", so there is also no such animal as the Russian, the American, the Italian, the Catholic, the Jew or the Yankee. Rather, there are individual organisms, each of which has characteristics for which inheritance or environment may have been responsible. Any rational attempt to deal with these organisms in agriculture, medicine or world politics calls primarily for an understanding of the particular creatures responsible for situations in their particular environments.

Since rather detailed reports of these

papers will appear in March in the Association's journal, *The Biology Teacher*, there is no necessity for presenting abstracts here. There is little doubt that Dr. Allyn "stole the show", not because he had one of the more interesting topics, but because he chose to present his philosophy by giving specific experiences he had had with particular rattlesnakes, copperheads, janitors, wives, neighbors, and children and almost any imaginable combination of these.

The dinner meeting was marked by the introduction of Miss Ruth Dodge of Johnstown, New York, the new president-elect succeeding the new president, Professor Michaud, and by a paper presented by Dr. A. L. Winsor, director of the School of Education of Cornell University. Judging from the frequency with which notes were taken and from the subsequent comments made after adjournment, the paper was most popular. It dealt with the problems of the selection and maintenance of science teachers and the general consensus was that each listener wished that it could have been heard by his own administrative head. The paper will be abstracted in *The Biology Teacher*.

GARDEN STARS

(Continued from page 136)

cross them with the native chestnut, a few of which are still struggling to survive.

An interesting idea for a small place is the apple tree that bears five kinds of fruit. These are offered by several nurseries. A typical one has three varieties of red apples and two of yellow, including both Red and Yellow Delicious and my old favorite, McIntosh. You can, of course, work over an established apple tree yourself by grafting.

For the house there are, of course, such plants as fancy-leafed caladiums (Elephant Ear), which are easy to grow from bulbs and are as colorful as flowers. Tuberous begonias should be started now for planting outdoors later on. They are not new, but many gardeners have never grown them and they are decidedly one of the jewels of the garden. African violets have become so popular that a society has been formed, following a show in Atlanta where there were 10,000 entries. These come in white and pink as well as purple, are easy to grow and easy to propagate; but never allow water to touch the leaves.

Another nice thing for the window garden is a dwarf orange tree—not just a seedling but a cultivated one that grows slowly into a bushy, compact plant. A small one, with baby oranges on it, can

be had from florists. They are extremely hardy indoors, and, in summer, can be placed on the porch, or the pot can be set in the border.

I just asked a gardening friend what she thought about the new things. She replied that she had not seen anything, in the way of hardy plants introduced in recent years, that compared with Daphne Somerset. Perhaps so, and if you do not have it, this is the time to order one for your garden. And that might be a good note on which to stop.

Registering Plants

New varieties of shrubs, trees or vines may be registered under a new plan announced by Dr. Richard P. White, executive secretary of the American Association of Nurserymen. This service fills a gap that has existed for some time in plant registration. Registration cards are available from the association's headquarters, 636 Southern Building, Washington 5, D. C.

Smithsonian Catalog

The results of seventy-one years of scientific publishing by the United States National Museum are listed and indexed in a new bulletin just issued by the Smithsonian Institution. This is a complete catalog of the Museum's publications since 1875. Since then some 3600 separate publications have been issued, ranging in size from two-page leaflets to thousand-page books, covering a wide range. Although the Museum publications are usually issued in small editions, they enjoy a wide distribution in libraries throughout the world, and the new catalog will make the specific publications more usable.

Seed Catalogs

From the U. S. Department of Agriculture comes a strong plea for everyone to put to work the seed catalogs that flood the mails right after the postman has finished the holiday deliveries. In 1948, it is pointed out, the home gardener faces a task comparable to that of war days, with a goal of twenty million Freedom Gardens set for the year. So, the urge is, pay attention to the seed catalogs. We always do, anyway, for they are fascinating literature of a specialized sort. Already several beautiful ones have come to hand—Burpee's, with its wide variety of offerings; Jackson and Perkins, with roses beautifully dominant; Dreer's, Henderson's and others, giving the northern gardener hours of preliminary pleasure while he waits for the frost to get out of the ground. Seeds are ample, this year, the soil is waiting and food is important.

Gladiolus

100 Bulbs only \$1.69

Imagine! Real Michigan grown GLADIOLUS BULBS at less than 2¢ each! Assortment of flaming reds, yellows, purples, blues, etc., now ready for first blooms and with many years of flowering ahead. Any bulb not developing first planting replaced free. Tremendous saving and world of satisfaction in developing your Gladiolus from these young virile bulbs already 1½" to 2½" in circumference. For amateur and expert alike. Truly an unbeatable offer. Order now on approval.

3 TUBEROSES GIVEN—SEND NO MONEY
On arrival: pay \$1.69 plus C.O.D. postage on satisfaction or money back guarantee! Cash orders sent prepaid. With shipment comes surprise lot of 3 TUBEROSES. Bloom into tall waxy white flowers 2-3 ft. tall, extremely fragrant. Makes this a bargain you'll hate to miss. Order now from

MICHIGAN BULB CO., Dept. GW-1814 Grand Rapids 2, Mich.

FLOWER LOVERS

Join the Bulb of the Month Club. You too can enjoy continuous bloom in your living room, throughout the year. Enclose one dollar with your name and address. You will receive by return mail, postpaid, this month's carton of rare flower bulbs—guaranteed to grow in your home or office. No dues no obligations, your dollar covers all membership privileges. Send your dollar today, to—

BULB OF THE MONTH CLUB, Box 54A Algonquin, Ill.

SPECIAL OFFER

Norway Spruce, 4 yr. transplanted, 5 to 10 in. tall — only \$1 postpaid. 25 only \$2 postpaid! Another bargain: 40 Evergreens \$3 postpaid; all transplanted, 3' to 10' tall. For each Red Pine, Scotch Pine, Black Hill Spruce, White Spruce, all 40 for \$3. (West of Miss. River add 25c). Free illustrated price list of small Evergreen Trees.

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LOOK FOR THE LEAF ON THE PACKAGE

VOICES OF SPRING

(Continued from page 128)

sides of the throat, are inflated almost to the size of the head. Although usually given from above the surface, the call may come from beneath. During the singing, the air is forced back from the vocal sacs into the lungs. An individual voice is not very loud, but collectively they can dominate a pool with their extremely low-pitched, bass call of "ker-r-r-r-o-o-a-a-k." If we watch a single leopard frog in a chorus in the brackish marshes, we notice that when it makes several quick croaks its sacs are being inflated. When these sacs are filled, they suddenly collapse as the air is forced back into the lungs. The sacs may be again distended without even a noticeable break in the guttural croaks. At the beginning of a breeding season there are more males evident than females, and when several concentrate on clasping with one female they will take no notice of human intrusion. Much force must be exerted to disentangle them from their tenacious hold.

The pickerel frog is often mistaken for the leopard frog, both from a likeness in appearance and voice. The pickerel frog's croaking, however, is much less evident in duration and intensity. If we listen for the subdued croak of the pickerel frog, we become aware of its "gentle, musical snore" quality. However, the singing male is difficult to uncover since it prefers to sing in a hidden position. If discovered, the most noticeable thing about it will be its inflated vocal sacs on the sides of the neck and throat. These are not as prominent as those of the leopard frog. The low-pitched, guttural croak has little carrying power. The frog is a favorite from its handsome grace and the ease with which it is captured. It thus makes a most attractive pet for a terrarium, and does not become such a nuisance by peeping, croaking, or trilling constantly during the breeding season as do other frogs in captivity. But beware of placing it in a receptacle with other frogs, for you may find all your other species dead. This is caused by the toxic secretions that are given off by the skin glands of the pickerel's back.

One of the most interesting of our spring frogs is the diminutive cricket frog. Anyone who has roamed the fields or woodland in spring must have stirred up this frog. Its call is highly distinctive, and is easily recognized among the voices of other frogs and toads. The song consists of a series of sharp clickings that resemble the pressing of a handful of boy's marbles in one's hand.

The cricket frog is not as shy as other spring frogs. It can be approached while it is singing its peculiar grating song, its body pulsating violently with every click. When observed for a few minutes it seems almost ridiculous in its singing

fervor. In the sunlight, its bright-yellow, inflated throat fairly gleams, and it is often observed sitting quietly for several minutes with distended bubble and without uttering a sound. Numbers of cricket frogs hop around the edges of ponds, streams, and pools of water in meadows, and their long, conspicuous snouts, and warty bodies embellished with green or brown stripes easily identify them. The call is given in a series of about thirty sharp clicks, beginning in a slow sequence and finally accelerating in tempo, ending suddenly. If we frighten them into silence, their singing can easily be revived by knocking two round pebbles together.

In late April and early May, when the lush greenness and sweet-smelling air of spring are at their maximum, two other singers make their appearance. The voice of Fowler's toad is the most distinctive of those species that trill. Its call is a short, harsh, metallic droning, and it is especially odd to most ears when the song begins in a high register and finally descends into an almost melancholy mood, lasting about two or three seconds. To a musical ear, the almost moaning sound is decidedly unpleasant, but from a distance—and the carrying power of this song is great—the weird effect produced is rather interesting. If we find a dark-throated male calling from the side of a stream, it will not make a frantic attempt to escape, but will actually "pose," enough to allow us to sketch its serenading position. The pouch that is distended under the chin is somewhat larger than the head, and these toads often remain with a huge bubble inflated for long periods, sometimes singing and sometimes silent.

The Fowler's toad is often mistaken for the American toad, but they differ markedly in their songs. The American toad, which breeds somewhat earlier than its relative, has a sweeter, higher-pitched, musical trill. This song is often sustained for as long as twenty seconds, depending on the temperature and humidity, which also regulate the ardor of the call. This song can be easily imitated by trilling in a low monotone, drawing in or expelling air between moist lips. Often the two species of toads breed in the same pond, and hybrids result from interbreeding. These plain creatures, fashioned with jewel-like eyes that make their gold flakes dance from the reflections of our lights, more than compensate for their appearance with their soothing song. On a spring night when the trilling of toads comes floating across the woodland, a feeling of enchantment pervades the atmosphere. No elaborate concert this, but a succession of sweet musical sounds of wild creatures.

The green frog makes itself known at the same time as Fowler's toad, although it is active in late March. The symphony of the swamplands is complete when a

sound like the plucking of a string on a bass violin is heard on the grassy edge of a pool. No other frog is capable of this note, and the green frog makes this sound while it is submerged. It swells out its throat and the front of its shoulders, and then emits two or three of its explosive and low-pitched vibrant "plunking" sounds, in as many seconds. More often it sounds like a guitar's "kitung." Many people mistake the green frogs for bullfrogs. The small green frogs that are present in the water, those that are not calling, are too young to call like the adults. If we frighten one, it will leap into the water and give an explosive, high-pitched, screaming "yeerp." Two of the most noticeable things about the green frog are the absence of a chorus of "kitungs," and the fact that they are not highly gregarious.

The common tree frog is the sophisticated member of the family, preferring to frequent an exalted habitat in trees, descending to water only during the breeding season. It is best known for its supposed forecasting of wet weather, and is often called the rainfrog. As early as late April, the first melodious calls are heard, usually scattered in the woods about a breeding site, often trilling from the top of shrubs and trees. The call is a loud, low-pitched, short musical trill. When observed during the height of the breeding period in the water, this frog inflates its throat pouch to about the size of the head, and the trilling commences, lasting about two seconds, and is repeated about every one-half minute. The trill may have as many as ten to thirty notes, depending on the humidity and temperature. This mellow and pronounced trill helps to distinguish the treefrog from any other forms. However, it has a variety of calls that may confuse many observers; first the normal loud trill; secondly the turkey gobbling note, resembling a mournful "chow, chow"; finally the forms that have a harsh, shorter and more forceful call.

Soon after the chorus of treefrogs is in full swing the familiar "chug-o-rum" of the bullfrog resounds resonantly from the ponds, usually after dark. This, one of the most aquatic of our frogs, enjoys sprawling out with just the nose and eyes protruding above the surface of the water. It is frequently surprised along the edges of sluggish rivers, streams and ponds, which furnish deep water for swimming, and shallow water for sitting. Shores grown up with alders, willows and other water-loving plants furnish shade and concealment. It is from these ecological niches that the male's deep, drawn-out, booming call is heard. At night the bel-low of the bullfrog carries for great distances, sometimes for several miles. The sides of the throat and front of the shoulders swell considerably, and the sound is

(Continued on page 164)

THE READER'S MARKET

A place where members of the American Nature Association and readers of Nature Magazine may find many interesting offerings or may advertise themselves, at low cost, for things wanted; things they have for Sale, for Trade, for Sale or Trade. This is an excellent forum for acquiring or disposing of such items as binoculars, books, cameras and photographic equipment, magazines, sports and outdoor equipment, etc.

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2. *All orders subject to these conditions:* We reserve the right to edit all copy to conform with our standards and to reject or discontinue any advertisement which we consider undesirable.

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5. *How to count numerals etc.:* Groups of figures are counted as one word. Abbreviations consisting of initials or single characters

likewise are counted as one word. Hyphenated words are counted as two words.

6. *"For Sale" ads must state prices:* A specific price must be stated on all FOR SALE ads—except that the phrase "write for catalog" may be used when listing real estate or merchandise in quantities.

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8. *Non-specific phrases barred:* Phrases such as "highest" or "top prices paid", as well as any other so-called "auction-type" phrases are

not acceptable. The terms "fair price paid" or "state price wanted" may be used.

9. *Blind ads not acceptable:* Box number or blind ads will not be accepted. Give your complete name and address to insure prompt delivery of all mail or telegraph replies.

10. *Requesting privilege of examination:* Purchasers desirous of examining merchandise before acceptance should request shipment by express C. O. D. with examination privilege. This procedure permits the purchaser to inspect the merchandise in local express office and authorizes the express company to return unsatisfactory merchandise at shipper's expense.

11. The association will not accept for publication in NATURE MAGAZINE, advertisements of firearms, ammunition, or patent medicines.

12. *Responsibility for illegible copy:* Type or print advertisement plainly as we cannot be responsible for errors due to illegible writing.

13. *Closing date:* The closing date of all advertisements is the 20th of the second month preceding month of issue.

ANTIQUE GLASS FOR SALE

MOON AND STAR: List for stamp. Forrest Sowers, Doylestown, Penna.

BIOLOGICAL SUPPLIES

BIOLOGICAL SUPPLY and HOBBY Catalogue 10¢; Chameleons 25¢; alligator, \$1.75; Austrian crested newts \$1.50 pair. Current animal list, 5¢. Quivira Specialties, Topeka, Kansas.

BIRDS

CANARIES AT WORK and Play; new book; training, care and fun. \$2.50. Free Circular. Wetzel Publishing Co., 524 So. Spring St., Los Angeles 13, California.

BOOKS

NATURE LOVERS' LIBRARY—6 volumes 8½x11, 2000 pages, weight 23 lbs.; lives and habits 3000 species birds and animals described by renowned Naturalists; 1000 species illustrated, 300 in color. The Literary Mart, 8 East 33rd St., New York, offers this set to members for \$29.50 payable \$4.50 with order, \$5.00 monthly; full refund for return in 5 days.

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COLLECTOR'S CATALOG: National Geographic, Arizona Highways, other magazines and books. Send 10¢. Jack Hellar, P. O. Box 2507, Los Angeles 53, California.

Two NOTABLE SHELL BOOKS: East Coast Marine Shells (\$5.00) and World-Wide Sea Shells (\$4.50) postpaid; thousands of illustrations, pages free. Also superb colored slides of shells. Author: Maxwell Smith, Winter Park, Florida.

"MIRACLES OF SCIENCE", 39 Chapters, \$2.00. Christian Evidence League, Malverne, N. Y.

"LENT AND EASTER CUSTOMS", 25¢. People Christian Bulletin, Box 87-N, Cathedral Station, New York 25, N. Y.

BUTTERFLIES

LIVING COCOONS: 15 assorted including Luna, \$2.00. M. Spelman, 2781 Concourse, New York 58, N. Y.

LIVING SILK MOTH Cocoons—15 for \$1.00. Mixed Pupae 12 for \$1.25. Praying Mantis egg masses for Insect Control 15 for \$1.00. Postage extra. Dr. Miller, Box 47, Station "E", Brooklyn 7, New York.

BUTTERFLIES: 15 U. S. named, including Zebra \$2.00; 15 Mexican including Calico \$2.00; 15 Amazon beauties including Blue Morpho \$2.00. M. Spelman, 2781 Grand Concourse, New York 58, N. Y.

DOGS

REGISTERED Redbone and Blacktan coonhound pups. Parents A-1 cooners. Illustrated folder, 25¢. W. B. Frisbee, R-1, Clarence, Missouri.

REGISTERED long eared black and tan fox and coonhound pups. Royce Coon, Ghent, New York.

FIELD GLASSES

TELESCOPES, BINOCULARS, Microscopes—big bargain, catalog free. Brownscope Company, 24 West 45th St., New York.

HOBBIES

EARTHWORM CULTURE. A fascinating hobby; profitable home industry. Write for valuable free bulletin—review on "Earthworms: Their Intensive Propagation and Use."—Thomas J. Barrett, Earthmaster Farms, Box D-488, Roscoe, California.

YOU CAN ENTERTAIN with chalk talks. Catalog 10¢. J. G. Balda, Cartoonist, Oshkosh, Wis.

INDIAN RELIC COLLECTION, spear, arrow, drill, knife, scraper \$1.00. 10 different Sea Shells \$1.00. Williams, 405A South Monroe, Green Bay, Wisconsin.

HEMOCRAFTSMAN

LEATHER AND METAL CRAFTERS! Fine leathers, tools, accessories; tooling metals and supplies. Free catalogs. Kit Kraft, Dept. NA3, 3203 W. Washington Blvd., Los Angeles 16, Calif.

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"ROMANCE IN STONES." Arizona rare minerals. Collectors or museum grade, 12 miniatures, assorted, colorful, brilliant, genuinely rare, \$3. Sam Parker, 620 North Third St., Phoenix, Arizona.

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MEISSNER 3 TUBE Student Radios. With tubes, phones, short wave coils, \$16.75. Sound Snap, 479 Parkwood, Columbus 3, Ohio.

PIGEONS

BOOK OF THE PIGEON—256 fascinating pages; 230 splendid photographs. 70 varieties, also doves. Practical information—housing, feeding, breeding of fancy, racing, utility pigeons. Satisfaction assured. Only \$3, postpaid. Order today! Pigeon Loft, Sherman Oaks, Calif. (Circular free).

VOICES OF SPRING

(Continued from page 162)

emitted four or five times, with intervals of a second.

During late April and extending into May and June, one of the loveliest frogs makes its appearance, announced by one of the most raucous voices of all. If we are attracted to a pond in southern Maryland, we realize, at once that the frog croaking in a discordant tone must be an unusual one. Toward the latter part of the day, and especially if the weather is hot, and on into the dusk a chorus of "quonk, quonk, quonk, cronk, cronk, quank, quank," greets one. From the cattails the honking notes are being produced loudly, but our approach silences those nearest to us. Finally our light shines upon a frog perched on a bush or reed two or three feet above the water. It is the delicate green tree frog, its throat distended to almost twice the size of its head. It is a slender, shiny and smooth-looking frog, with the brightest green ground color reflecting in our lights. It is undisturbed by our intrusion and continues alternately to inflate and deflate the throat and the body. When the croaks stop, the sac does not completely collapse. When the song begins again, the calls will be given more rapidly than before, and the interesting "bo-bay, bo-bay, bo-bay" sound that Francis Harper, a well-known naturalist, recorded, will result when two individuals are calling together. The green tree frog does most of its croaking on cattail reeds but eventually finds itself pursuing a female in the water, singing fervently.

Nowhere else in the realm of Nature, except among birds, can one find such vocal individuality and pleasant music as among frogs and toads. Those creatures passionately celebrate and welcome the gentlest season of them all with melodious zeal. In all of the lands of the earth where spring is evident, the solos and choruses of frogs and toads are bringing joy and music to those who have had enough of winter.

PLANTS FROM LEAVES

(Continued from page 152)

twenty-two pieces measured only one inch, while the single vigorous shoot from the sister leaf was thrice as high. Although by cutting up the leaf we can to a certain extent increase the efficiency of the utilization of the substance of the leaf by the new plantlets, which means that we are rewarded by a greater total weight of new growth from the cut leaf, the difference is not nearly so considerable as appears at first sight. In a rough way, the size of the new plantlet is proportional to the amount of leaf tissue it has to draw nourishment from.

A very informative experiment may be carried out with a whole leaf that has

produced only one or a few plantlets. If these are cut away close to the leaf, other notches spring into activity, and from these arise new shoots to replace the excised ones. Usually these will be suppressed plantlets that were visibly larger than the rest, but whose further growth was prevented by the dominant shoot. As these spring up with fresh vigor, they, in turn, dominate those that had been still weaker. Or it is possible to obtain the same result without sacrificing the most advanced plantlets, by cutting up the old leaf as we have described for a fresh one. If the leaf has been several months removed from the parent plant, certain of the pieces will be unable to form plantlets, because the bud in the notch has died during its long period of suppression. One is tempted to moralize, and to think of one of the great empires of history, which, after the death of its Alexander or its Genghis Khan, fell again into its constituent kingdoms, of which each raised up a ruler of its own.

How do the one or two plants that somehow get the better start so effectively prevent the development of all the other rudiments on the leaf, all of which have like potentialities of growth? If we knew this, we could explain how it is that the terminal bud of the life plant, which grows up straight and branchless, inhibits the development of the buds in the axils of all the leaves, and how these together prevent the growth of plantlets from the notches of leaves still attached to the stem. The problem is not at all confined to the life plant, nor to any single group of plants, but is fundamental to all vegetation. By cutting a potato, we cause eyes to sprout. Left in direct communication with the other eyes of the tuber, they would remain dormant. By pruning a fruit tree, we stimulate the development of buds, which, but for the removal of other buds, would continue indefinitely in their winter sleep. It is because of this faculty of certain favorably situated buds to dominate over and suppress other buds of equal potentialities of growth that trees grow tall and straight and shapely, instead of sprawling over the ground, as they otherwise most certainly should. Some have supposed that the most rapidly growing shoots hold their neighbors in subjection by drawing off the nutrient materials from them and keeping them in a state of starvation; other botanists believe that the dominant buds of fastest growth send off hormones or chemical messengers that repress the activity of their weaker neighbors. There is doubtless a certain amount of truth in both views, but in the present state of our knowledge we cannot give definite answers to our questions. But in our experiments with the leaves of *bryophyllum* we are brought face to face with one of the most fundamental and at the same time most baffling problems that face the

student of plant development.

The related *Bryophyllum crenatum* differs in many respects from the more familiar life plant. The thick, fleshy, glaucous leaves are smaller, have fewer notches, and are always simple. While they are still attached to the stem, the germ of the plantlet in each notch is so far advanced that it may be seen with a good pocket-lens; and with a microscope the rudiments of the first two leaves can be discerned. Upon the removal of the leaves from the plant, the shoots appear first in the notches and are followed by the roots, although in the common life plant the order is the reverse. Nor can we in this species increase the number of plantlets produced by a leaf through isolating the notches by cutting the leaf into pieces; for all of the notches even of an intact leaf as a rule produce plantlets which, if the leaf is kept moderately moist, shoot up quickly and soon fall away from the parent leaf, which then either withers or decays. On the other hand, many of the pieces of a cut leaf wither without giving birth to shoots.

The Crassulaceae, or orpine family, of which the life plant is a member, contains a large number of succulent, thick-leaved herbs and half-shrubs. The foliage of many of these plants, in addition to *bryophyllum*, has the ability to produce new individuals. In a greenhouse, the fallen leaves of *Crassula*, *Sedum* and *Echeveria* sprout as they lie on the dry earth or cinders between the pots. The new growths, roots as well as shoots, arise from the scar left by the detachment of the leaf from the stem; for no preformed buds are present on the margins, as with *bryophyllum*. The growth of the plantlets is almost entirely at the expense of the water stored in the swollen leaves.

Nature is at once resourceful and capricious. Leaves are among the organs she least frequently uses for the production of new individuals; but even here the variety in detail is quite amazing; and we have been able to mention only a small proportion of the plants that produce new growth from their leaves, and of the methods by which this is accomplished. Why should *Bryophyllum calycinum* and *B. crenatum* form plantlets from their leaves and not from their roots, whereas *Bryophyllum proliferum* produces plantlets from roots and flower-stalk more readily than from the leaves? How does it happen that the white-margined leaves of the bowstring hemp produce new plants readily, but these without exception differ from the parent in that their leaves lack the white border, although they retain the attractive, wavy cross-variegation? These and other caprices we shall perhaps never fully comprehend; but the effort to unravel them lends zest to the study of Nature, and gives us a deeper appreciation of the marvellous complexity of plant life.

Ole Evinrude

Back in Norway many Evinrudes had sailed the seven seas, but Andrew Evinrude was a man of the soil—the Wisconsin soil—and he found it difficult to understand why his son Ole did not seem to care to put his roots in the soil also. But we are stealing Gordon MacQuarrie's stuff, and invite your attention to an attractive and interesting little booklet entitled "Ole Evinrude and the Old Fellows", issued by Evinrude Motors, Milwaukee 9, Wisconsin. It is a fascinating and delightfully written story of an interesting man, a pioneer, and of American achievement.

Fur Farming

Fur Farming for Profit. By Frank G. Ashbrook. New York, 1948. Orange Judd Publishing Company. 429 pages. Illustrated. \$4.00.

This is a revised and entirely reset edition of the book by the same author originally published by Macmillan in 1928. Twenty years have seen great advances in the knowledge of techniques of farm raising of fur animals. Today this industry offers great hope of relieving the drain upon the numbers of our wild-trapped furbearers, as well as mitigating the obvious cruelties of the steel trap. The author writes with a quarter-century of background in the field of fur farming, and has had a great deal to do with guiding and stimulating an infant industry to its present considerable position today. This book is certainly a "must" for any beginner, or for anyone working in the field of fur animal management.

Earthworms and Soil

Harnessing the Earthworm. By Thomas J. Barrett. Boston, 1948. Bruce Humphries, Inc. 179 pages. Illustrated. \$2.50.

"In her vast humus factory," writes Thomas J. Barrett, "Nature uses many processes—slow combustion, chemical disintegration, bacterial decomposition, fermentation, heat, light, darkness, wind and rain, frost and sun—and earthworms, all these unite, finally to form that thin surface layer of dark earth in which life is rooted." This book is the story of that last-named worker in the humus factory; it is the story of the earthworm in Nature, of what has been learned about it in the past, and what has been brought forth in scientific literature. Then the author proceeds to an evaluation of the earthworm's contribution to soil fertility and, therefore, to prosperity. Having developed all of these points, and, it seems to us, demonstrated the importance of this humble laborer, Dr. Barrett provides practical information on earthworm culture. And he concludes his discussion with the assertion that the earthworm is

the most important animal in the world, and with the assurance that if you wish to build topsoil you can do it by feeding earthworms. We believe that this is an important book. We know that it is written against a background of long study and experiment by the author. We have a hunch that this discussion will attract a wide audience. It may stir up some controversy, which will be healthy—but it cannot fail to stimulate others both to action and to investigation.

Buffalo Salon

Hobbies, the magazine of the Buffalo Museum of Science, will hang its Tenth International Salon of Nature Photography from May 18 through June 14 at the Museum. There will be both monochrome and color sections, and several classes of pictures. The last date for receiving entries will be May 15, and full information will be sent on request to *Hobbies*, Buffalo Museum of Science, Humboldt Park, Buffalo, New York.

Wilderness Trail Trips

Again this year H. Frank Evans will conduct three ten-day trail trips into the back country of Glacier National Park. These are all-expense affairs specially designed to appeal to the lover of the outdoors who possesses at least average hiking ability. The route of the trips takes the visitor into primitive sections of the Park reached only by a few visitors each year. Full details may be obtained by dropping a line to H. Frank Evans, 817 Indiana Avenue, Coeur d'Alene, Idaho. In the past a number of members of the American Nature Association have made these trips, and, Mr. Evans writes, have been "wonderful guests."

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Under the Microscope

By JULIAN D. CORRINGTON

MACROGRAPHS FROM SLIDES COURTESY WARD'S NATIONAL SCIENCE ESTABLISHMENT, INC.

MOSQUITOES

I. Adults

“THE mosquitoes are bad tonight,” is a remark met by general agreement and by about as much concern as if one stated, “It’s going to rain before morning.” Can you imagine someone saying that the tigers are bad tonight, or that rattlesnakes are thick down on Maple Avenue?

We see to it, in civilized communities, that the larger and more obviously dangerous animals are eliminated, yet continue to tolerate those classed as pests. No amount of education or propaganda seems sufficient to prod the citizens of a community to the point where adequate pest control is enforced. We accept the principle, but balk at the high cost, although we would willingly subscribe a fourth of our incomes, were it necessary, for tiger eradication in the city.

Probably the whole concept of grave danger from tiny animals is too new—we have yet to celebrate the centennial of Pasteur’s proof of the germ principle of disease, and it was not until 1880 that his compatriot, Laveran, found malarial organisms in human blood. So the politicians, non-science-minded, pass laws requiring enormous expenditures for national defense, but could not be jockeyed into appropriating a like sum for an all-out attack upon rats, fleas, lice, ticks, or mosquitoes, any one of which is far more dangerous to mankind than some maverick group of his own species.

The near extirpation of the human race in medieval times by plague, that terrible epidemic that involves a man-rat-flea-bacillus cooperative effort, is but one example of the price we have always paid for pest toleration. An age-old louse-borne problem is epidemic typhus, and a newer one is tick fever, but all other arthropods pale into insignificance as vectors of disease alongside mosquitoes.



Yellow-fever mosquito, *Aedes aegypti*, female, 8X.

These are the world’s number one killers, the real Public Enemy of civilization. We can shoot dangerous tigers and even, after colossal cost, Napoleons and Hitlers, but where is the man who will do away forever with malaria, yellow fever, dengue, and filariasis by exterminating mosquitoes? Nations could unite to do this job at a fraction of the cost of World War II, but—spend great sums just to kill mosquitoes?—why, they’re only a pest! The physician then points out that malaria is the cause of more deaths than any other communicable disease, and that there are some 300,000,000 cases in the world today with about 13,000,000 new infections each year. He goes on, if this is not sufficient, to discuss jungle yellow fever, pointing out that suitable mosquito hosts are abundant throughout the Eastern United States, and that airplanes arrive there daily from South American localities where this dread disease slumbers in non-epidemic form. Will the giant awake and go forth to smite the modern world?

While this morbid medical information emphasizes the great importance of mosquitoes to human life and health, we must also add their nuisance value to the bill. Large sections of the earth’s surface are uninhabitable, other regions are entered only under peril of many itching bites, and few indeed are the localities free at all seasons from these infernal skin-drillers. Mosquitoes, then, are certainly one of the most important to



Yellow-fever mosquito, male, 8X.



House mosquito, *Culex pipiens*, female, 8X.

man of all forms of animal life, and justly merit the enormous amount of study that has been accorded them.

These ubiquitous pests constitute a compact family, Culicidae, of the order Diptera, or flies. They differ from other and similar flies, such as crane flies, sand flies, midges, and various gnats, by having the mouthparts formed into a proboscis and the rear margins and veins of the wings clothed with scales. These are easily discerned characteristics, so that even the beginner in entomology need make no errors in distinguishing mosquitoes from other flies.

The antennae are filiform (thread-like) in type; long and slender, with 14 to 15 segments and with whorls of fine hairs; those of males are so bushy as to be termed plumose, a ready means of identifying the sexes. The compound eyes are bean-shaped and ocelli are lacking. The mouthparts constitute a classic example of the piercing-sucking type, each element of the primitive chewing apparatus, seen in grasshoppers, being highly modified. The labrum and epipharynx are united to form a sucking tube, the mandibles and maxillae are long piercing bristles, termed stylets, the hypopharynx is a saliva-carrier, and the labium a sheath for the other parts. Maxillary palps are present at the sides, sensory in function.

Mosquito legs are notoriously long and slender, while the wings are long and narrow. Halteres are distinctly visible. The abdomen is elongate, consisting of ten segments. Thus all parts of these flies are built on the long, slender, and fragile plan—body, antennae, mouthparts, wings, and legs—a feature to be kept in mind while capturing and mounting specimens, as they are easily damaged.

Three tribes or subfamilies are recognized, one of which, the Megarhinini, contains only the single genus, *Megarhinus*, with large, showy, and non-blood-sucking species. All other mosquitoes are comprised within either the Anophelini or the Culicini, the distinctions being of great importance in medical entomology. Of the something like 1500 known species of the family, about 200 are *anopheline*, 1300 *culicine*. Only the anopheline species carry human malaria.

Anopheline mosquitoes usually have spotted wings; the scutellum, or rear dorsal division of the exoskeleton of the mesothorax, is evenly rounded; the maxillary palps of both sexes are approximately as long as the proboscis and, best known and most readily discerned of all characteristics, the entire axis of these insects—proboscis, head, thorax, and abdomen—forms a straight line, so that they have to “stand on their heads,” with the third pair of legs projecting up into the air when resting or biting. By contrast, *culicine* mosquitoes usually have unspotted wings, the scutellum exhibits three lobes, the maxillary palps of females are very

short, and the body axis is not straight, the proboscis pointing downward and forward, the profile being hump-backed and all six legs capable of reaching the substratum when resting or feeding.

All of the anopheline species are now considered to belong to a single genus, the notorious *Anopheles*, whereas many genera are recognized in the Culicini. Essig states that there are approximately 89 genera and subgenera for the world, of which 39 are North American. Chief culicine genera include: *Aedes*, 302 species, worldwide; *Culex*, 309, worldwide; *Psorophora*, 29, American tropics; *Taeniorhynchus*, 49, cosmopolitan in the tropics; *Theobaldia*, 8, North American; and *Wyeomyia*, 3, in North America.

Mosquitoes provide a classic illustration of Kipling's famous quip about the female of the species. Male mosquitoes feed on nectar and other plant juices and are never blood suckers. They congregate in vast swarms, in many species, soon after transforming, and the females dart into the dancing swarm in order to select mates. After breeding, the work of the males is done and they live but a short time longer. The females then seek a blood meal, then repair to a suitable site to lay their eggs, an operation that may continue all season, to a total of some 500 eggs. Some females die with the arrival of cold weather, others winter over.

There is a tremendous variation in details of habits and the life cycle, so that malariologists and mosquito-control people need to know a great deal more than the foregoing generalities with regard to the mosquitoes of their particular locality. Some instances of specific habits follow.

Many forms can breed in coastal salt-water marshes, one of the most celebrated being the white-banded salt marsh mosquito, *Aedes sollicitans*, more commonly called the New Jersey mosquito, although it occurs from Maine to Texas, and throughout that long range is the subject of countless jests and yarns, and render many a summer's evening unendurable. The value of coastal real estate as well as the success of summer resorts depends on an effective program of control of this famous pest. It is classed as a “wild” species. On the other hand, *Aedes aegypti*, the yellow-fever mosquito, is a household breeder or “domesticated” type; females will lay their eggs in any sort of receptacle or depression that will hold an ounce of water, indoors or out. Hoof-prints, garden pools, ruts, tin cans, barrels, drains, gutters, flower pots, vases—these and countless other breeding sites make necessary the maintenance of household inspections by public health officers in tropical cities.

Most mosquitoes are shade lovers and attack only in shady places, twilight, or at night, but *Anopheles atropos* will come after you in blazing sunlight, while *Aedes*

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Malarial mosquito, *Anopheles quadrimaculatus*, female, 6X.

ægypti flies by day, also, until it takes its first blood meal, then becomes nocturnal. Some mosquitoes attack only frogs, others go for birds, still others prefer wild mammals. Many of these will transfer their attentions to any human victim who presents himself for the blood-letting, and some species prefer man to all other hosts.

Aedes sollicitans is said to migrate as much as forty miles, whereas the house mosquitoes, *Culex pipiens* of the North, and *C. quinquefasciatus* (also written *C. 5-fasciatus*) of the South, remain close to the place where the eggs from whence they came were laid. Such facts may have much to do with the rapidity of spread of mosquito-borne diseases. Many species winter over as adults, whereas others do not. As a rule, eggs laid in water hatch out with little delay, the adults resulting from those laid late in the year wintering over, as in *Culex pipiens*; eggs laid at random on soil do the wintering over, whether or not rain converts their site into a pool in the fall or winter. In such cases, as obtains with most species of *Aedes*, those eggs receiving sufficient moisture in the spring will hatch. Late fall adults lay their eggs, then die. *Aedes ægypti*, however, breeds throughout the year. It may invade the temperate zone in the summer, but is killed off by the first frost, which is now known to be the explanation of the decline of yellow-fever epidemics with the onset of cold weather.

In breeding habits, *Aedes ægypti* again shows an interesting variation. In this species, the males do the mate selection and in the daytime. Experimental work on a number of species has shown that fertilized eggs will not complete their maturing unless and until the female takes one or more blood meals, the assumption being that some substance in blood is essential.

All other interests concerning mosquitoes are minor, although, in conformity to their role as vectors or carriers of pathogenic organisms. Some thirty species of *Anopheles* are chiefly involved in the spread of malaria. Perhaps twenty others have been demonstrated as possible vectors, and some authorities think that all anophelines are suspect.

Among culicine species, *Aedes ægypti* is by far the most important. Not only is it the main vector of yellow fever, but it may also carry dengue fever, filariasis, certain forms of equine encephalitis, and it can carry tularemia mechanically. Jungle yellow fever is transmitted by *Aedes leucocelaenus*, while numerous forms of *Culex*, *Anopheles*, *Aedes* and *Taniorhynchus* are involved, in various regions, with carrying filariasis in man, heart worm in dogs, bird malaria, and still other widespread and highly important infections.

As an example of the *modus operandi* of disease spread

through this agency, let us follow a case of malaria.

A female of the woodland malarial mosquito, *Anopheles punctipennis* (for example) transforms from the pupal stage, mates and fares forth in quest of a blood meal. By chance she bites the arm of a fisherman who does not have malaria; the tiny wound swells and stings slightly, but nothing further happens. Neither man nor mosquito harbors any infection. Later, this insect bites a lad who has malaria. The labial sheath is drawn back out of the way, exposing the six stylets; the two mandibles, with scalpel-like terminations, and two maxillae, whose terminal blades are saw-toothed, make the puncture; the hypopharynx and labrum-epipharynx are inserted and saliva is pumped down the fine canal of the former, serving to prevent clotting of the blood, keeping it flowing; the labrum-epipharynx forms the side walls and roof, the hypopharynx the floor of the suction tube through which the female then draws her blood meal.

Along with the ingested blood, the mosquito now receives some malarial parasites, which proceed to multiply and undergo essential stages in their life cycle, partly in relation to the mosquito's stomach, partly in the salivary glands. Only after a definite lapse of time for these changes do the salivary glands of the insect contain parasites, and only then is this mosquito infective. If she then bites a human victim, some of the malarial organisms are forced into the wound along with the mosquito's saliva. After another incubation period, the human host is then infective for other mosquitoes.

Each animal, man and mosquito, is essential for completion of the parasite's life cycle. Both hosts are entirely innocent of any ulterior design or complicity, but only one is rendered ill. The mosquito is unaffected.

We shall continue this account in future issues with discussions of other stages in the careers of various mosquitoes. Students in this division of public health work must know the eggs, larvae, and pupae, as well as the adults; much of the control effort is directed at these developmental states.

TRAP FOR SMALL INVERTEBRATES AND PROTOZOA

An eight ounce, cylindrical, glass jar with metal screw cap top is used. The top is perforated with holes about one-sixteenth inch in diameter and a piece of twine is tied tightly around the constriction near the open end of the jar.

The trap may be baited with various substances. We have used beef, liver, wheat, hemp seed, and egg yolk (hard boiled). Small pieces (about one-half inch in diameter) of egg yolk will attract *Dugesia tigrina*, the brown planarian, while beef or beef liver is excellent bait for *Dugesia dorotocephala*, the black planarian. Wheat or hemp seed is used for protozoa and water molds.

The bait is placed in the jar, the cap screwed in place, and the jar allowed to sink to the bottom of pond or stream. The twine serves to anchor the trap and as a ready means of retrieving it.

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